

# Journal

## OF THE AMERICAN VETERINARY MEDICAL ASSOCIATION

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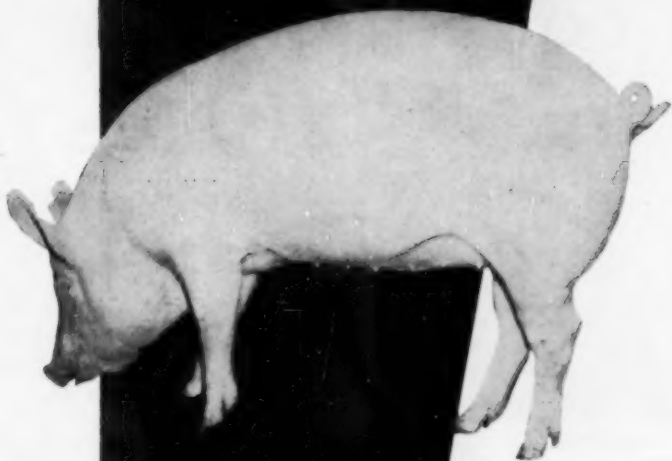
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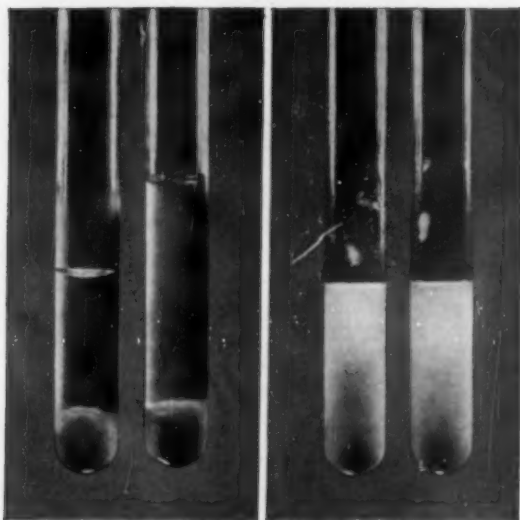
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**Q.** Should lactating cows be treated with phenothiazine?

**A.** Generally speaking, not at present . . . because “pheno” can be excreted as a dye in milk, rendering it undesirable for human consumption. However, Wisconsin University experiments indicate that preventive worm control with low levels of phenothiazine may be safe for use on producing dairy animals. Researchers found that cows protected by 2 grams of “pheno” in their daily ration produced milk showing no evidence of the drug or its derivatives.\* Further research is being carried on in this field and new findings are expected soon.

\*University of Wisconsin Bulletin 518, Part I, January, 1956

**Q.** Why is phenothiazine in salt especially effective for low-level feeding?

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## News From Washington



Drs. B. T. Simms, director, Livestock Research, ARS, and J. L. Hourigan chief, Special Disease Section, ADE Branch, ARS, departed shortly after January 1 for Great Britain and France to review and evaluate research being conducted on **scrapie**, and to consider whether additional research on this disease should be undertaken in the U. S. or abroad.

Continued inspection of cattle in Colorado revealed additional cases of **scabies** (see JOURNAL, Dec. 15, 1956, adv. p. 12). Four counties now under federal quarantine are Los Animas, Otero, Crowley, and Bent. The only infestation outside Colorado was reported by a practitioner in Ohio in a shipment from the infested Colorado area. Shipment was made prior to quarantine of the Colorado area.

The ARS reports as of December 12, 548 counties in the U. S. now modified certified brucellosis-free. This includes counties in the five states certified under the over-all program (see JOURNAL Oct. 15, 1956: adv. p. 8), 248 counties in other states. In 1956, 150 counties were certified.

The ARS has called a western regional conference on anaplasmosis to discuss control measures that may be applicable in that region. State and federal veterinarians and representatives from colleges in 11 western states are expected to attend the conference on Jan. 23, 1957, at Salt Lake City, Utah. Dr. C. D. VanHouweling, director, Livestock Regulatory Program, ARS, will preside.

Western States Meat Packers Association asked the U.S.D.A. to provide emergency funds to employ a larger staff of meat inspectors. Spokesman for the association stated the **critical shortage of inspectors** is forcing some packers to cut back their killing operations. One cause of the inspector shortage, it was reported, is the rapid increase of plants approved for federal inspection; 35 of 56 approved are in cities and towns where inspection was not previously conducted. Also, Congress did not provide funds for the expanded work.

ARS published a proposed regulation in the "Federal Register" (Dec., 7, 1956) which would prohibit the interstate movement of poultry known to be infected with psittacosis.

It is understood Army Secretary Brucker forwarded a plan to Defense Secretary Wilson on or about December 15, in compliance with the latter's memorandum of May 15 relative to **utilization of veterinary personnel** and service (see JOURNAL, 1956: June 1, p. 566; June 15, adv. p. 12; July 15, adv. p. 8; Aug. 15, adv. p. 8). The plan submitted is now under study in Secretary Wilson's office. It is hoped the Defense Secretary will examine carefully not only the current staff study but also previous studies by the Army on the subject prior to reaching a decision. Also, that serious consideration be given by him to the numerous letters, resolutions, and other communications received in his office expressing opposition to any change in the present status of the Army and Air Force veterinary services. Included among those who believe an organized military veterinary service is essential in the U. S. and overseas, and so informed the Defense Secretary, are: Members of Congress, Health Resources Advisory Committee, Office of Defense Mobilization, A.M.A., Association of Land Grant Colleges, Reserve Officers Association, Western States Meat Packers Association. Many high officials in the Army and Air Force hold like views, including the Surgeons General.

Orders calling 20, 1956 veterinary graduates to active Army duty have been revoked. No doubt this will work a hardship on some who made plans to enter extended active duty on January 9.



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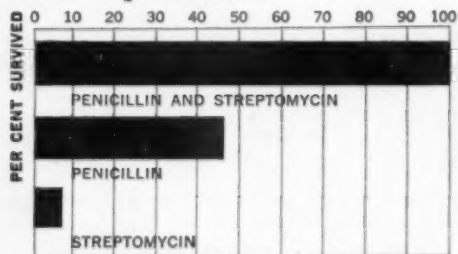
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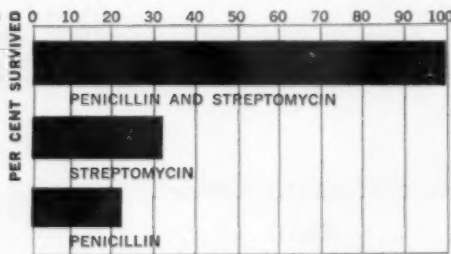
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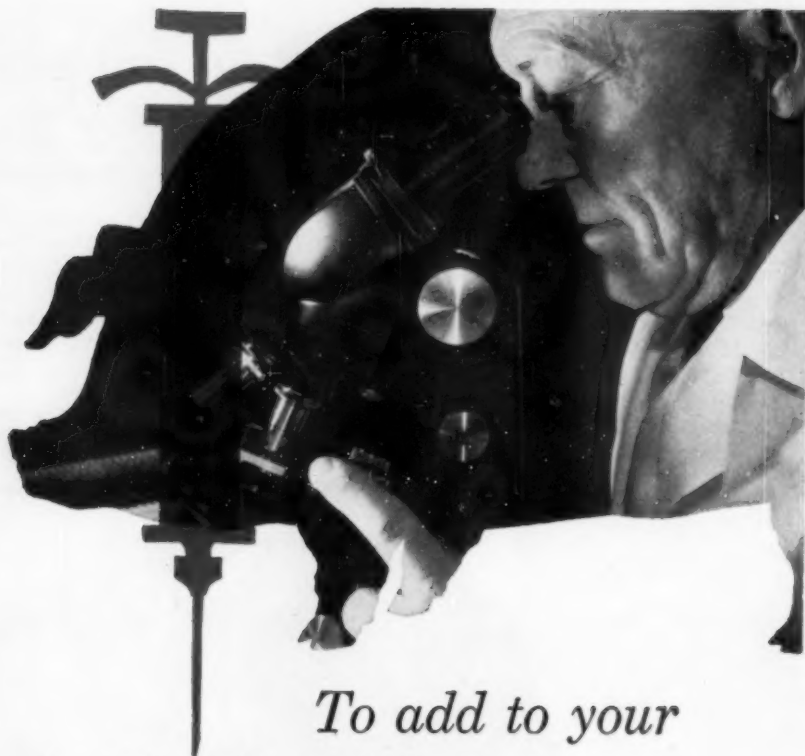
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## The Apparent Inhibitory Effect of Avianized Vaccine on Canine Rabies in the Incubative Stage

D. R. WESTGARTH, M.Sc., and C. W. WELLS, B.Sc., M.R.C.V.S., D.T.V.M.

*Kuala Lumpur, Malaya*

THE STATISTICAL analysis that forms the major part of this paper was prompted by the hypothesis, expressed elsewhere by one of the authors,<sup>14</sup> that during the 1952 Kuala Lumpur rabies epizootic, the large-scale use of chicken embryo vaccine (Flury strain) had inhibited the development of rabies in dogs presumed to have been in the incubative stage of the disease when vaccinated. Detailed field observations suggested strongly that some explanation other than chance must be sought for the fact that within the first eight weeks of the compulsory vaccination campaign there were only 7 cases of rabies in vaccinated dogs while there were 28 in unvaccinated dogs.

The published evidence of other workers does not, in the main, favor this hypothesis.

It was considered,<sup>10</sup> in 1946, that postexposure vaccination might, "under certain circumstances" that are not specified, protect animals. It was recorded,<sup>1</sup> in 1950, that none of 1,376 exposed, but previously vaccinated, dogs contracted rabies after revaccination. Unconfirmed evidence is cited<sup>11</sup> concerning some 30 dogs vaccinated with a double dose of Flury strain vaccine up to five days after being bitten by a rabid fox. None showed symptoms of rabies one year later. One small experiment,<sup>12</sup> in 1921, indicated that protection of dogs is possible if vaccine is given two to six days after injection of street virus; other workers cited,<sup>9</sup> in 1929, indicated that some protection may have been conferred by vaccinating dogs 21 to 45 hours after infection. Evidence was presented,<sup>13</sup> in 1950, that rabies street virus infection of laboratory animals can be prevented by postexposure vaccination, provided this takes place within 24 hours of the inoculation of street virus.

Mr. Westgarth is statistician, Rubber Research Institute of Malaya, Kuala Lumpur, and Mr. Wells is deputy director of Veterinary Service, Federation of Malaya.

The authors thank Mr. C. W. Dunnett and Mr. R. Bolton of the Research Division, American Cyanamid Company, Pearl River, N. Y., for advice and criticisms.

Conversely, other workers<sup>8</sup> stated, in 1951, that they were unable to save the life of a single experimental animal exposed to street virus and then treated only with serial injections of phenolized vaccine. It was later concluded<sup>15</sup> that Flury vaccine given 24 hours after experimental exposure to street virus has little or no effect.

As far as the present authors are aware, no statistical analysis of the data of a mass vaccination campaign in which chicken embryo adapted rabies vaccine (Flury strain) has been used has yet been published. The analysis that follows suggests that the hypothesis which is the subject of this paper can be supported by the data for the serious Kuala Lumpur epizootic.

(This epizootic was dealt with as part of a plan to eradicate rabies from the Federation of Malaya. A summary of the general plan has been reported,<sup>14</sup> and special features up to 1954, when eradication appeared to have been effected, have been described.<sup>15\*</sup>)

### ANALYSIS

Rabies vaccination, using chicken embryo adapted vaccine (Flury strain), started in Kuala Lumpur on Aug. 4, 1952, and the present study is confined to the first eight weeks of the vaccination program, when all the 7 observed positive cases of rabies among vaccinated dogs occurred. There were 28 positive cases in unvaccinated dogs in the same period, and 11 further cases in unvaccinated dogs by mid-June, 1953, when the last case in the area was recorded.

Only rarely in Malaya have cases of canine rabies been observed to follow bites inflicted less than eight weeks, or more than 12 weeks, earlier. Hence, in attempting to study inhibitory effects during the

\*See abstract on page 60.

incubative stage we have confined the period of study to the eight weeks immediately following the start of the vaccination program. Consequently, all exposures which would have resulted in clinical rabies during this eight-week period are assumed to have occurred before the start of the vaccination program. Certainly, all 7 positive vaccinated animals contracted rabies within 20 days of vaccination and were clearly unvaccinated at the time of exposure.

If immunity had not been established by vaccination prior to exposure, and if the hypothesis is made that vaccination during the incubation period has no beneficial effect, then the expected proportion of positive cases observed in a given week among those vaccinated should equal the proportion among the unvaccinated. The estimated size of the vaccinated and unvaccinated populations during each of the eight weeks (table 1) ignores births and deaths from causes other than shooting, since these rates should be approximately the same in both populations.

The table also lists the number of positive cases observed each week among vaccinated and unvaccinated animals. These are contrasted with the theoretical expectation of positive cases under the hypothesis that the proportion of positives in a given week is the same in both categories. This proportion may, however, vary from week to week. The probabilities quoted in the final column of table 1 have been calculated, using the exact test for a 2-by-2 contingency table described by Fisher,<sup>2</sup> and they represent the chance of obtaining the observed (or more diverse) values if this hypothesis of proportionality is true.

It is noteworthy that in seven of the eight weeks, the observed number of positive cases among the vaccinated dogs was less than the expected number. Moreover,

in the second and sixth weeks, the discrepancy was significant.

The 7 cases of rabies observed among the vaccinated dogs during the eight weeks are compared with a theoretical expectation of about 16. Among the unvaccinated, the observed total was 28, contrasting with an expectation of about 19. Applying the *chi-square* test, we find that the observed values differ significantly from their expectations, thereby indicating that the hypothesis of equal proportionality is untenable.

#### DISCUSSION

Our observation that incubation rarely occupies less than eight weeks is limited to those instances in which owners have observed a biting incident. Precise Malayan records on this are not available nor, under field conditions, could they be compiled with accuracy. Observers in other countries have reported shorter incubation periods, but there is wide agreement that incubation periods of less than three weeks are improbable. Thus, although it is conceivable that some of the reduction in rabies in vaccinated animals during the latter part of the eight-week period might be due to immunity conferred by vaccination prior to exposure, we consider that this factor can not account for all the observed discrepancy between observation and expectation. Moreover, up to the end of the third week, the observed cases totaled 3 in the vaccinated and 18 in unvaccinated animals and deviated significantly from their respective expectations of 7.4 and 13.6 ( $\chi^2 = 4.04$ ). In the second week alone, significant departures from expectation are established. Such results can not be attributed to vaccination conferring immunity prior to exposure.

Because much of the strength of our case depends on the results manifested in the

TABLE 1—Number of Positive Cases Observed During the Eight Weeks Immediately Following the Start of the Vaccination Program

Week (No.)	Estimated population (midweek)		No. of positive cases				Probability
	Vaccinated	Unvaccinated	Vaccinated		Unvaccinated		
			Observed	Expected	Observed	Expected	
1	2,954	15,260	0	1.0	6	3.0	0.35
2	7,004	11,086	0	3.1	8	4.9	0.02*
3	8,548	9,416	3	3.3	4	3.7	0.55
4	9,374	8,464	2	1.6	1	1.4	0.54
5	9,750	7,938	1	1.1	1	0.9	0.70
6	9,750	7,764	0	2.8	5	2.2	0.02*
7	10,750	6,590	0	0.6	1	0.4	0.38
8	12,560	4,606	1	2.2	2	0.8	0.18
Total			7	15.7	28	19.3	$\chi^2 = 8.74^\dagger$

\*Significance at the 5 per cent level.

†Significance at the 1 per cent level.

second week, the objection that the vaccine could not have acted inhibitorily in so short a period must be met. For it to have so acted, it would seem that the modified virus had pre-empted susceptible cells against invasion by the street virus present in the tissues of the hosts. Precocious antibody development is another, but more remote, possibility which is considered as follows.

No data can be found on serum neutralization tests performed earlier than one month after inoculation of Flury virus vaccine. In any case, tests performed later than one month after inoculation suggest that serological response following the immunization of dogs with either this vaccine or a phenolized vaccine is not a reliable index of resistance to experimental infection with street virus.<sup>6</sup> It is questionable whether sufficient antibody could be present two weeks after vaccination to neutralize infection.

That "interference" may have produced the effect seems to be a stronger possibility. The neurotropic affinity of the Flury virus appears to have been profoundly affected by its adaptation to the embryonating egg<sup>3</sup>; there is experimental evidence that even at three weeks after vaccination (with the sixtieth and seventy-ninth egg passage of Flury virus) dogs were solidly immune to challenge with street virus.<sup>4</sup> The rapid development of a resistant state following the inoculation of a modified live virus, and attributed to interference, is a well recognized property of certain vaccines, e.g., egg-adapted Ranikhet (Newcastle disease) vaccine.

Without speculating as to whether immunity to rabies is a tissue immunity or a humoral one, or theorizing on the route by which the modified Flury virus spreads from the inoculation site, it would appear that *prima facie* grounds exist for believing that the modified Flury virus might interfere with street virus, under certain conditions. Experimentally, such an effect was not demonstrated,<sup>8</sup> in 1954, but the quantity of street virus injected, and the route, may have been too powerful an antagonist for the modified virus.

The results in our observations from the second week onward can be explained by assuming that interference occurred, and this possibility can not at the moment be discounted. Only further laboratory and field observations will settle the point.

Nearly 1,200 dogs were destroyed by

shooting during the eight-week period. These were predominantly unvaccinated animals and may have included cases which subsequently would have developed rabies. If this shooting among the unvaccinated was random, then it should have no effect on the proportion of cases in that group. Hypothetically, had the shooting tended to concentrate on animals that were clinically suspect, then the effect would have been to underestimate the already excessive proportion of the disease in the unvaccinated population.

Only cases confirmed in the laboratory are included in the data and it is possible that others were undetected or unreported. If so, this would increase the difference between the proportions, since the vaccinated animals include no strays and their owners are more likely to report or detect infected animals.

It is difficult to decide, with confidence, to what extent the exposure risks differed between the vaccinated and unvaccinated categories. This constitutes, perhaps, the major shortcoming in data in which we are considering an involuntary outbreak of rabies rather than the results of a controlled experiment. For example, it is likely that muzzling was more carefully observed among vaccinated animals, but a muzzled dog in a heterogeneous population may run a greater risk of being bitten than an unmuzzled dog—which is not the same thing as saying that muzzling encourages rabies.

Similarly, the vaccinated population does not include animals aged less than 4 months, but the risk of exposure of a young animal is probably less than for others. Hence, the placing of all young dogs in the unvaccinated group has, if anything, helped to reduce the proportion of positive cases in that group.

On the other hand, it must be recognized that stray dogs are unlikely to be vaccinated and, because of their unrestricted movement, may run a greater risk of exposure to rabies. However, the majority of the strays had been shot before the start of the vaccination program. From the shooting records, and the fact that strays were finally virtually eliminated, it is possible to form an estimate of the number of strays present each week. The strays were estimated at 9 per cent of the total population at the beginning of the period under study and at 4 per cent at the end of the period.

Recapitulating, we consider that indication of inhibition exists even if exceptionally short incubation periods have occurred, and that an "interference" theory can reasonably account for the significant results in the early stages. We recognize that various extraneous factors may have influenced the results, but the strays were relatively few, and the removal of possible bias due to shooting discrimination, undetected cases, muzzling, and the nonvaccination of young dogs would appear to lend further weight to the argument that vaccination after exposure has an inhibitory effect.

### CONCLUSIONS

We conclude that the number of cases of rabies among vaccinated dogs (all of which are estimated to have been unvaccinated at the time of exposure) is significantly less than would be expected under a hypothesis of equal proportionality of positive cases in vaccinated and unvaccinated categories. We further conclude that the data provide a promising indication that vaccination with chicken-embryo-adapted rabies vaccine (Flury strain) after exposure tends to inhibit development of the disease.

### References

- <sup>1</sup>Bailey, J.: Prophylaxie de la rage. *Bull. Off. Internat. Epizoot.*, 34, (1950): 16-36.
- <sup>2</sup>Fisher, R. A.: *Statistical Methods for Research Workers*. 10th ed. Oliver and Boyd, Edinburgh, 1948.
- <sup>3</sup>Koprowski, H., and Cox, H. R.: Studies on Chick-Embryo Adapted Rabies Virus. I. Culture Characteristics and Pathogenicity. *J. Immunol.*, 60, (1948): 533-554.
- <sup>4</sup>Koprowski, H., and Black, J.: Studies on Chick-Embryo Adapted Rabies Virus. II. Pathogenicity for Dogs and Use of Egg-Adapted Strains for Vaccination Purposes. *J. Immunol.*, 64, (1950): 185-196.
- <sup>5</sup>Koprowski, H., and Cox, H. R.: Recent Developments in the Prophylaxis of Rabies. *Am. J. Pub. Health*, 41, (1951): 1483-1489.
- <sup>6</sup>Koprowski, H., and Black, J.: Studies on Chick-Embryo Adapted Rabies Virus. III. Duration of Immunity in Vaccinated Dogs. *Proc. Soc. Exptl. Biol. and Med.*, 80, (1952): 410-415.
- <sup>7</sup>Koprowski, H., and Black, J.: Studies on Chick-Embryo Adapted Rabies Virus. V. Protection of Animals with Antiserum and Living Attenuated Virus After Exposure to Street Strain of Rabies Virus. *J. Immunol.*, 72, (1954): 85-93.
- <sup>8</sup>Koprowski, H., and Burkhardt, R. L.: Newer Knowledge Concerning Rabies. *Proc. Book, AVMA* (1954): 460-468.
- <sup>9</sup>McKendrick, A. G.: Rabies. A Review of Recent Articles. XI. *Trop. Dis. Bull.*, 26, (1929): 725-739.
- <sup>10</sup>Rhodes, A. J.: Anti-Rabies Treatment. A Discussion of Its Value in the Light of Recent Experimental Work. *Trop. Dis. Bull.*, 43, (1946): 975-991.
- <sup>11</sup>Stafford, A. L., and Starr, L. E.: The Use of Avianized Anti-Rabies Vaccine on a County-Wide Basis. *Proc. Book, AVMA* (1950): 142-148.
- <sup>12</sup>Tenbroeck, C.: Prevention of Street Virus Infection by Vaccine. *Proc. Soc. Exptl. Biol. and Med.*, 75, (1950): 528-531.
- <sup>13</sup>Umeno, S., and Doi, Y.: A Study on the Anti-Rabies Inoculation of Dogs and the Results of its Practical Application. *Kitasato Arch. Exptl. Med.*, 4, (1921): 89-108.
- <sup>14</sup>Wells, C. W.: (1954). The Control of Rabies in Malaya Through Compulsory Mass Vaccination of Dogs. *Bull. World Health Organ.*, 10, (1954): 731-742.
- <sup>15</sup>Wells, C. W., and Westgarth, D. R.: I. A Summary of the 1952-1954 Rabies Control Campaign in Malaya, with Particular Reference to the Use of Chicken-Embryo Vaccine Before and After Eradication Had Been Effected. II. Forecasting the Proportion of Vaccinated Dogs. *Brit. Vet. J.*, 112, 219-238.

### Rabies Control in Malaya

Rabies, which had been endemic in northern Malaya for 30 years, extended to the southern portion early in 1952. Eradication from the new area was effected by June, 1953, by the systematic destruction of stray dogs and compulsory vaccination of others. An immune belt, 30 to 50 miles wide, was then created at the border of the clean area. It is being maintained by compulsory annual vaccination of all dogs 3 months of age or older. Teams of dogshooters immediately follow the vaccination teams and destroy all dogs not wearing the readily visible vaccination tags.—*Brit. Vet. J.*, June, 1956.

### Rabies

A number of countries are, at present, free from rabies, either because they have been able to eliminate it or because they have been able to protect themselves by the strict application of proper police sanitary regulations to the exclusion of any process of immunization. The United States is among the countries most afflicted. Mention should be made of an important fact announced by the Ministry of Agriculture of Great Britain, i.e., 2 dogs have shown symptoms of rabies after more than six months' quarantine and another at the end of nearly eight months.

In certain countries, vaccination of dogs has been practiced in a more or less generalized manner for many years without any significant reduction in rabies. Thus, in Algeria, vaccination has been carried out for 20 years and has been compulsory since

1951, yet rabies continues at about the same level as before vaccination. Some time ago, the vaccination program in Israel (using Flury vaccine) was credited with a great reduction of this disease. However, since 1954 the number of cases of rabies has greatly increased. One must, therefore, ask whether the use of Flury vaccine might be an indirect cause (through neglect of the application of sanitary regulations) or a direct cause of this rapid recrudescence of rabies. One should consider whether among dogs, and in particular in pups, the virus vaccine has not regained the virulence attenuated through passages in the chicken embryo. Vaccination in Israel has not been, as was claimed in the

*WHO Chronicle*, a success but, on the contrary, has been a failure.

The essential role in the prophylaxis of rabies belongs to the police sanitary measures. The emphasis must be placed on strict application of these measures—slaughter of all animals affected with rabies and those which have been in contact with affected animals, notification of all cases of rabies, destruction of animals which can be vectors, and prohibition of imports from countries where the disease is prevalent, as well as the judicious use of vaccination by means of inactivated vaccines.—[G. Ramon: *Technical Report of the Director of the International Office of Epizootics. Off. Internat. des Epizoot.*, 46, (1956):29-51.]—J. P. SCOTT.

### Studies with Flury Rabies Vaccine in Pups

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THE FLURY STRAIN<sup>1</sup> of rabies, adapted to propagate in the chicken embryo,<sup>2</sup> has been used successfully for vaccination of dogs over the world.<sup>3</sup> Since much of the developmental work has been done in dogs over 5 months of age, the vaccine is generally recommended for this age group and older. Rabies is known to occur in dogs younger than 5 months. It was, therefore, considered desirable to investigate the safety and efficacy of the product for younger dogs. Furthermore, since 3 cc. is a large dose for intramuscular injection, particularly in smaller breeds, the efficacy of the vaccine when injected subcutaneously was reinvestigated.

It was decided, therefore, to vaccinate young pups either intramuscularly or subcutaneously, to make antibody assays at three-month intervals and, finally, to challenge the immunity of each dog with virulent virus to determine individual resistance.

#### MATERIALS AND METHODS

**Dogs.**—Forty pups, 6 to 12 weeks old, in eight litters, were obtained from farms around Zionsville, Ind. When received, they were quarantined for two weeks and then each pup was vaccinated for canine distemper and infectious canine hepatitis

with three 5-cc. doses of virogen D-H\* at weekly intervals. The pups were housed as litters in indoor kennels for three months, then were moved to outside pens, and were segregated according to the route of vaccination. At the time of challenge, 14 young dogs were added as controls.

**Mice.**—The mice used in the serum-neutralization tests were white Swiss, weighing 14 to 16 Gm., obtained from a commercial supply.

**Vaccine.**—The vaccine used was rabies vaccine, modified live virus, chicken embryo origin, vacuum dried.\* The single-dose vials were selected at random from a serial being marketed at the time of the test.

**Vaccination Procedures.**—The pups were given the rabies vaccine concurrently with the distemper vaccine two weeks after they were acquired. Approximately half of the pups (21) of each litter were given 3 cc. of the vaccine, immediately after it was rehydrated with cold diluent, by injecting it deeply into the muscles of the thigh with a sterile syringe and a 1-inch, 20-gauge needle. The remaining 19 pups were given subcutaneous injections into the deep prescapular fasciae. There was no evidence of marked pain upon injection and no abscesses or sustained swellings occurred.

**Serum-Neutralization Tests.**—The serological tests were performed according to the techniques described in the World Health Organization monograph.<sup>4</sup> In the serum-neutralization test, varying dilutions of serum (1:5, 1:25, 1:125, and 1:625 or 1:2, 1:4, 1:8, 1:16, etc.) were mixed with an equal quantity of fixed virus and incubated at 37

<sup>1</sup>From the Pitman-Moore Company, Indianapolis, Ind.

\*Produced by Pitman-Moore Company, Indianapolis, Ind.



C. for three hours. The concentration of fixed virus was such that, after the mixing and incubation, it contained approximately 100 mouse l.d.<sub>50</sub> per test dose. After incubation, 0.03 cc. of each mixture was injected intracerebrally into a group of white Swiss mice weighing about 15 Gm. each. The symptoms and deaths were recorded for 14 days, and the 50 per cent end point was calculated by the method of Reed and Muench.<sup>8</sup> Simultaneously, other groups of mice were injected with virus alone, to determine the challenge dose.

The serums used in the tests were pools of equal amounts of the individual serums and were grouped as follows: (1) from all of the pups vaccinated subcutaneously; (2) from all those vaccinated intramuscularly; (3) from all that were 6 to 9 weeks old at the time of intramuscular injection; and (4) from all 9 to 12 weeks old at the time of intramuscular injection.

**Viruses.**—The fixed virus used in the neutralization test was Pitman-Moore Company stock virus No. 980, a descendant of the original Pasteur virus, which is maintained by passage in rabbits. The street virus used for challenge (0.1 cc. injected into each masseter muscle) was a suspension of the salivary glands of a dog which had died of rabies and which was obtained from the Indiana State Board of Health.

**Histopathology.**—Necropsies were performed on the dogs immediately after death, except in a few instances in which this could not be done and postmortem degeneration precluded a critical study. From each dog considered suitable for histological study, representative tissue blocks from the cerebellum, medulla, pons, and hippocampus were taken and fixed in technicon solution, washed, dehydrated, and embedded in paraffin. Histological sections were cut 7  $\mu$  thick and stained with azure-eosin for routine study. Duplicate sections were stained by Lillie's modification of Stovall and Black's method for Negri body demonstration.<sup>9</sup>

## RESULTS

**Safety.**—Ill effects were not observed in any of the pups during a daily observation period of 90 days following vaccination.

**Serum-Neutralization Tests.**—No neu-

TABLE 1—Antibody Response of Animals Vaccinated with Rabies Vaccine, Chicken Embryo Origin

	Subcutaneous	Intramuscular	Challenge virus
Prevaccination	<1:2	<1:2	38 l.d. <sub>50</sub>
3 mo. postvaccination			
First test	<1:2	1:9.60	38 l.d. <sub>50</sub>
Second test			
All pups	Not tested	1:8.0	90 l.d. <sub>50</sub>
Age 6-9 weeks	Not tested	1:3.084	90 l.d. <sub>50</sub>
Age 9-12 weeks	Not tested	>1:16.0*	90 l.d. <sub>50</sub>
6 1/4 mo. postvaccination			
All pups	Not tested	1:3.444	90 l.d. <sub>50</sub>
Age 6-9 weeks	Not tested	<1:2.0†	90 l.d. <sub>50</sub>
Age 9-12 weeks	Not tested	1:6.708	90 l.d. <sub>50</sub>
9 mo. postvaccination	Not tested	Serum available; not tested	

\*Slightly greater than >; †Slightly less than <.

tralizing antibody was detectable (table 1) prior to vaccination or after subcutaneous vaccination. Three months after intramuscular vaccination, 0.015 cc. of a 1:9.6 dilution of serum protected 50 per cent of the mice against 38 l.d.<sub>50</sub> of virus and, in a second test on the same sample, a dilution of 1:8 protected against 90 l.d.<sub>50</sub>. (This indicated good reproducibility.) At six months after vaccination, the level had dropped to 1:3.444.

The antibody titers were not determined for each individual pup, but were lower for a pool of serum of the 6- to 9-week-old pups than for those 9 to 12 weeks old, at both three and six months after vaccination.

**Resistance to Challenge.**—At four and three-fourths months after the subcutane-

TABLE 2—Results of Challenge with Virulent Virus Four and Three-Fourths Months After Subcutaneous Vaccination

No. of pups	Status	Died	Negri positive	Encephalitis
17	Vaccinated	11*	0	9
3	Control	3	1	3

Incubation period

11 vaccinated pups—18, 18, 18, 18, 18, 19, 20, 22, 26, 28, and 32 days.

3 controls—21, 21, and 27 days.

\*Histological examination of 2 was unsatisfactory due to postmortem decomposition.

ous vaccination, only 6 of 17 (35%) of the vaccinated animals resisted a challenge which killed 100 per cent of 3 controls (table 2).

By contrast, 9 of 10 (90%) of those vaccinated intramuscularly were resistant nine months after vaccination to a challenge which killed 9 of 11 (82%) of the unvaccinated controls (table 3).

**Histopathology.**—With slight variation among individuals, the lesions were essentially similar in the control and previously vaccinated dogs which died following challenge with street rabies virus. A lesion, consistently found in all instances (table 2, 3), was a partially disseminated, non-

TABLE 3—Results of Challenge with Virulent Virus Nine Months After Intramuscular Vaccination

No. of pups	Status	Died	Negri positive	Encephalitis
10	Vaccinated (i.m.)	1	0	1
1	Vaccinated (s.c.)	1	0	1
11	Control	9	4	8

Incubation period

1 vaccinated i.m., 25 days; 1 vaccinated, s.c., 22 days.

9 controls 18, 18, 18, 19, 19, 20, 21, 22, and 25 days.

suppurative encephalitis characterized by slight-to-marked perivascular cuffing and patchy focal infiltration of lymphocytes. This lesion occurred regularly in the cerebellum, particularly in the base, but less often in the medulla and pons. In a few instances, scattered foci of glial proliferation were seen in all of the areas studied. In a majority of the animals, Negri bodies were observed in the large ganglion cells of Ammon's horn and in the Purkinje's cells of the cerebellar cortex.

#### CONCLUSIONS

Following the intramuscular vaccination of dogs over 5 months of age with the Flury rabies vaccine, 100 per cent protection is expected.<sup>6,7</sup> In this study, with young pups, 9 of 10 (90%) of those vaccinated resisted infection, nine months after vaccination, with a challenge dose which killed 9 of 11 (82%) of the unvaccinated controls. Only 6 of 17 (35%) of those vaccinated subcutaneously, resisted infection four and three-fourths months after vaccination with a challenge dose which killed 100 per cent of 3 controls. Even though the challenge was apparently severe, the protection was poor. This evidence of

immunity response to subcutaneous inoculation, which was evident in the preliminary studies, should further emphasize the importance of injecting Flury strain rabies vaccine by the intramuscular route only.

#### References

- <sup>1</sup>Leach, C. N., and Johnson, H. N.: Human Rabies, with Special Reference to Virus Distribution and Titer. *Am. J. Trop. Med.*, 20, (1940): 335-340.
- <sup>2</sup>Koprowski, H., and Cox, H. R.: Studies on Chick-Embryo Adapted Rabies Virus: Culture Characteristics and Pathogenicity. *J. Immunol.*, 60, (1948): 533-554.
- <sup>3</sup>World Health Organization: Bull. No. 10. Rabies. World Health Organization, Geneva, 1954.
- <sup>4</sup>World Health Organization: Monograph Series, No. 23. Laboratory Techniques in Rabies. World Health Organization, Geneva, 1954.
- <sup>5</sup>Reed, L. J., and Muench, H.: A Simple Method of Estimating 50 Per Cent Endpoints. *Am. J. Hyg.*, 27, (1938): 493-497.
- <sup>6</sup>Tierkel, E. S., Kissling, R. E., Ridson, M., and Habel, K.: A Brief Survey and Progress Report of Controlled Comparative Experiment in Canine Rabies Immunization. *Proc. Book, AVMA* (1953): 443-445.
- <sup>7</sup>Koprowski, H., and Black, J.: Studies on Chick-Embryo Adapted Virus. III. Duration of Immunity in Vaccinated Dogs. *Proc. Soc. Exptl. Biol. and Med.*, 80, (1952): 410-415.
- <sup>8</sup>Lillie, R. D.: Histopathologic Technique. Blakiston Co., Philadelphia and London (1953): 396.

## Rabies Epizootic in Dairy Cattle

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THE LARGEST single epizootic of rabies among dairy cattle in the history of Los Angeles County occurred at the Spanish-American Institute, Gardena, Calif., between February and August of 1956. The institution, a charitable home and trade school for boys, maintained a herd of 62 purebred Jersey cattle, 40 Berkshire swine, 1 horse, 2 goats, 2 beef steers, and chickens and rabbits. The large animals were kept in five separate enclosures.

Dr. Wilcox is head of the Department and Dr. Hubbard is senior veterinarian conducting disease investigations, Los Angeles County Livestock Department, Los Angeles, Calif.

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The large number of cattle involved, the peculiar syndrome in several of the animals, and the odd course of the disease seem to make this an unusual case. The symptoms demonstrated by the first few animals were extremely suggestive of food poisoning, which is not as unusual as it may appear. One case is reported<sup>1</sup> in which five competent veterinarians found all conditions in agreement with the diagnosis of insecticide poisoning in a group of cattle affected with rabies. The symptoms of rabies, especially in cattle, vary widely; one observer<sup>1</sup> is quoted as saying the symptoms of rabies can "be everything or nothing."

#### HISTORY

On March 1, 1956, our attention was called, by the attending veterinarian,<sup>2</sup> to a disease among dairy heifers. Three heifers and a steer had died

<sup>2</sup>Dr. John N. Klar, general practitioner, Gardena, Calif.



with a history and clinical picture not typical of any known disease entity. Symptoms reported consisted of partial loss of appetite, occasional bawling, and rapid loss of weight. Animals appeared bright just before death, which occurred in three to four days.

The first animal we saw was a heifer which had been ill approximately 24 hours. She was bright but gaunt, had a normal temperature, and ate sparingly. She would occasionally bawl quite normally as if uncomfortable but did not appear to be ill. Hematologically, her erythrocyte, leukocyte, and differential counts and hemoglobin were normal, as were those of a later case.

A food toxemia was suspected, possibly from moldy bread or from some new hay which also showed considerable mold. However, a laboratory found no injurious organisms in a sample of the hay.

The heifer died on March 2 and, in the next two days, a sow and a bull calf, not observed by us, died. Necropsies of the 3 animals on March 5 showed a consistent gastroenteritis (which seemed to support the theory that a toxin had been ingested) and congestion of the superficial vessels of the brains, which suggested that the unknown toxin might involve the nervous system.

On March 5, another heifer became ill. She appeared bright, had a normal temperature, but ate sparingly as previously affected heifers had done. She had been bawling but did not do so while we were present. On March 7, she was extremely restless, demonstrated muscular incoordination and, within a few hours, lay prone. She twisted her neck until the top of the head was flat on the ground. Intermittent tetanic spasms persisted until death. She was the first animal we had seen in the terminal stages and that showed signs of a neurotropic disorder. Postmortem findings again showed gastroenteritis and congestion of the superficial vessels of the brain.

Also on March 5, a milk cow that was off feed was isolated as another possible early case. She was bright, had a normal temperature, and we could see no symptoms. However, on March 9, she chased chickens but responded to handling by dairy personnel. A tentative diagnosis of rabies was made. She died March 10, and Negri bodies were found.

Prior to March 9, the only cattle affected had been a steer and 6 heifers, 2 of which we had observed. From then until April 25, 9 of the 14 animals lost (64%) were adults. Their symptoms were different from those of the heifers; nearly every adult affected showed some degree of fractiousness. One became "typically" ferocious and had to be destroyed.

In the following two-month period, no animals were affected. Then, on June 27, a yearling heifer died of rabies. Two additional young animals died on July 13 and August 16. The herd was vaccinated August 21, with avianized vaccine, and at this writing, Nov. 1, 1956, no more animals have been affected.

We observed all cases after March 12. All brains were removed, examined for Negri bodies, and suspensions were injected into mice.

As precautionary procedures, the haulers and handlers of the animal carcasses at the rendering plants wore rubber gloves and goggles. The carcasses were handled as little as possible and were disposed of by complete reduction. Six individuals who came in contact with the first undiagnosed cases in the dairy were given the Pasteur treatment.

#### SYLVATIC RABIES CONSIDERED

Because of the uniform rate of occurrence, the possibility of sylvatic rabies and of multiple exposure from wildlife was studied. There was evidence of gophers only although, in the past, skunks and opossums had been seen. The cattle pasture and adjacent area was studded with gopher holes and, in January, several gophers, driven from their runways by high water, were killed in the pigpens situated on higher ground.

Subsequently, 14 gophers were trapped and their brains were examined microscopically and by inoculating mice intracerebrally but all proved to be negative.

Two especially constructed nets were hung to trap bats during the night; however, a night search revealed a lack of nocturnal activity.

#### DISCUSSION

This herd epizootic was associated with an outbreak of canine rabies in the area.<sup>3</sup> A stray dog, seen on the institute grounds on February 7, 16 days prior to the first case, could possibly have been the vector.

Instances have been cited where dogs have caused greater damage, although not in such a concentrated area. In one case<sup>2</sup> 78 sheep died of rabies from a single attack by 1 or more dogs.

Some rabid dogs will actively seek out victims if they move. This could explain how animals in the five enclosures were involved. The rate of case occurrences and the duration of the epizootic were unusual but the same pattern can be experimentally produced by inoculating a group of dogs with diluted infectious material.

The gopher holes were so remote that, even if infected, it would be difficult for the occupants to cause such extensive infection in the animals. Vampire bats could cause as many deaths but they transmit only paralytic rabies. Furthermore, this area is far north of their known range. Insectivorous

TABLE 1—Animal Description and Laboratory Results

Case No.	Animal	Age (yr.)	Date of onset	Days ill	Examination for Negri bodies	Results of mouse test	
						Brain	Salivary gland
1*	Steer	1/2	Feb. 23	—	—	—	—
2	Heifer	1/2	Feb. 24	—	—	—	—
3	Heifer	1/2	Feb. 25	—	—	—	—
4	Heifer	1 1/2	Feb. 29	—	—	—	—
5	Heifer	2	Mar. 3	—	—	—	—
6	Sow	3 plus	Mar. 4	—	Positive	—	—
7	Bull	3 1/2	Mar. 5	—	Positive	—	—
8	Heifer	2	Mar. 7	—	—	—	—
9	Cow	3	Mar. 5	5	Positive	Positive	—
10	Heifer	2	Mar. 13	2	Positive	Positive	—
11	Heifer	1 1/2	Mar. 15	5	Positive	Positive	—
12	Cow	8	Mar. 18	3	Positive	Positive	—
13	Bull	3	Mar. 18	4	Positive	Positive	—
14	Cow	4	Mar. 19	6	Positive	Positive	—
15	Heifer	1	Mar. 29	4	Negative	Positive	—
16	Cow	4 1/2	Apr. 5	1	Negative	Positive	—
17	Heifer	1 1/2	Apr. 10	3	Positive	Positive	Positive
18	Heifer	1	Apr. 10	3	Positive	Positive	Negative
19	Cow	3 1/2	Apr. 11	3	Inconclusive	Positive	Positive
20	Cow	8	Apr. 14	2	Positive	Positive	Positive
21	Cow	9	Apr. 15	—	Positive	Positive	Positive
22	Cow	4 1/2	Apr. 23	1	Negative	Positive	Positive
23	Heifer	1	June 24	3	Positive	Positive	Positive
24	Heifer	1 1/2	July 9	4	Positive	Positive	Positive
25	Heifer	3/4	Aug. 12	4	Positive	Positive	—

\*This cow was an Aberdeen Angus; all other animals were Jerseys, except the Berkshire sow.

bats, even if rabid, probably could not cause an outbreak with this pattern.

For the above reasons, and since the large classical Negri bodies observed were typical for virus of canine origin, a dog was the most probable vector.

The deaths of the animals are listed chronologically (table 1). Cow 21 became ill after cow 20 but became furious and had to be destroyed. The observed duration of illness for the other 13 animals ranged from 36 hours to six days. The average duration was three days.

In the 38 years in which the Los Angeles county livestock inspector has observed and investigated rabies in cattle, only a few cases have been seen and they were invariably of the furious type. The incubation period for bovine rabies is reported to be two to 12 weeks, longer in some cases. In our experience, symptoms have usually appeared within three to six weeks and all animals affected were in a single enclosure.

In this instance, 22 animals in five separate enclosures died in a nine-week period, followed by three additional deaths at 18, 20, and 25 weeks. If there was only one exposure and the incubation period for the first case was two weeks, that for the last case (Aug. 16) was slightly over six months.

The delayed occurrence of the last 3 cases raised a question of other sources, possibly

secondary exposure from cattle affected earlier or of an undiscovered repeating source of sylvatic infection.

Each of the last 3 animals affected had been in corrals with cows previously ill with rabies, and had drunk from a common water supply. Also, their age might suggest a new infection, if younger animals are generally affected earlier. However, transmission between cattle is not accepted and a reevaluation of a possible sylvatic source was negative.

Of the 19 brains examined, four (21%) were inconclusive or negative for Negri bodies. Four of the positive brains showed only a few Negri bodies. In the mouse-inoculation tests, the 17 brains examined were positive and of the eight salivary glands tested, seven contained virus.

The virus was identified as rabies by a serum-neutralization test. No virus could be demonstrated in the colostrum of 1 positive heifer nor in the milk of 4 positive cows. One positive heifer died 24 hours postpartum but the brain of her stillborn calf was negative on both microscopic examination and mouse test. We assume that all deaths were due to rabies, although the brains of the first animals that died were not examined.

#### SUMMARY

1) An epizootic of rabies is described in which 24 cattle and 1 sow died over a six-

month period, including three "latent" cases.

2) The extreme variability in the symptomatology of rabies in cattle is illustrated.

3) Epidemiological studies implicate a dog as the probable source of infection.

4) Rabies virus was demonstrated in brain and salivary tissue, but not in milk or the brain of a stillborn calf.

#### References

- <sup>1</sup>Gibbons, W. J.: Diseases of the Nervous System. Vet. Med., 43, (1948): 139-141.  
<sup>2</sup>Henderson, J. A.: An Outbreak of Ovine Rabies. Vet. Med., 37, (1947): 88-89.  
<sup>3</sup>Pait, Charles F., and Forney, John E.: Canine Rabies in Los Angeles. Univ. South. California Med. Bull., 8, (1956): 5.  
<sup>4</sup>Radeleff, R. D.: Insecticide Poisoning. California Vet., 9, (1956): 32.

### Studies on Bat Rabies in Texas

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Rabies has long been one of the major zoonotic diseases of public health importance in Texas. The State Department of Health has obtained laboratory confirmation of the disease in most of the domestic animals and in a variety of wildlife. Skunks, certain species of which are often referred to as "hydrophobia cats," have been recorded as causing rabies in cowboys a hundred years ago along the Chisholm Trail. Seventy-two skunks, positive for rabies, were received by the Department from 30 counties in 1954 and 60, from 32 counties, in 1955.

Prior to 1946, rabies was seldom reported in the gray fox, an important species in the wildlife of Texas. However, in 1953, 150 rabid foxes were received from 44 counties; in 1954, 102 from 34 counties; and in 1955, 82 from 36 counties. Obviously, these positive cases represent but a fraction of the total. The removal and shipment of a fox's head, properly packed in ice, is seldom undertaken unless the animal has invaded premises during daylight hours and attacked animals or people. Foxes demon-

strating such drastically altered behavior are likely to be rabid.

Historically, canine and wildlife rabies has occurred principally in the eastern half of Texas. In recent years, there has been a marked westward shift in human population which has not yet been reflected in an expansion of the canine rabies area. However, several major epizootics in foxes were investigated in West Texas during the summer of 1956; a serious threat since dogs in that area were largely unvaccinated.

In Texas, there have been 35 human deaths from rabies during the past 12 years, reflecting the high level of rabies infection in dogs and in wildlife. The Texas State Department of Health Biologics Section annually furnishes physicians with more than 2,500 rabies treatments for man. Conservatively estimating this number as a third of the treatments administered by physicians, there would be in the state each year, 7,500 animal exposures of sufficient seriousness to warrant treatment.

Public health authorities in the states bordering Mexico have long been interested in vampire bat rabies in that country. The *Texas Health Bulletin* of May, 1952, reviewed the problem of wildlife rabies and concluded that, even though *Desmodus rotundus* was distributed from Argentina and Chile north to within 100 miles of the Texas border, there seemed little likelihood that it would become established in Texas in the foreseeable future.

However, in June, 1953, the Florida State Department of Health isolated rabies virus from an insectivorous bat. Although the vampire bat was not known to be present in Texas, vast concentrations of the Mexican free-tailed bat, *Tadarida mexicana*, are present during the warmer months of the year. Indications are that this bat spends its winters in Mexico or farther south, with the possibility of bat interspecies spread of rabies. Many of these bats utilize buildings and other structures as daytime resting places and feed around city street lights at night.

In November, 1953, rabies virus was isolated from a Mexican free-tailed bat found in a shed adjacent to the health department building in Austin and from a second bat of this species from a building near San Antonio. As a result, an extensive study of bats has been conducted for the past two years with financial assistance in the form

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of a National Institutes of Health research grant.

Over 2,000 bats of 12 species from 42 Texas counties have been tested for disease agents since the inception of our project. A majority have been Mexican free-tailed bats since they are by far the most numerous species. Included in the total have been four tree-frequenting species and eight which commonly utilize caves and rock shelters as daytime retreats.

Early investigations established the prevalence of rabies virus in the Mexican free-tailed bats and indicated the need for ecological and life history data to be used in the evaluation of the importance of this species in the over-all rabies problem in Texas. The only other species found naturally infected has been the red bat, *Lasiurus borealis* and, although 3 per cent were found to be rabid, this is considered of minor significance since they are rare in comparison with *T. mexicana*.

#### THE FREE-TAILED BAT

In Texas, the greatest concentrations of free-tailed bats are in the south central portion of the state, within the limits of the Edwards Plateau, an extensive tableland composed chiefly of cretaceous limestone. A total of nine caves has been located in this area, which are utilized by multimillions of *T. mexicana* as nurseries during the summer. This bat is common in West Texas but not in large colonies due to the dearth of suitable cave retreats. In southern Texas, it inhabits premises as there are no caves. It is seldom seen in East or North Texas.

Free-tailed bat caves in Central Texas are located as follows: Ney Cave and Valdina Farms Sinkhole (Medina Co.); Bracken Cave (Comal Co.); Frio Cave (Uvalde Co.); Devil's Sinkhole and Rucker Cave (Edwards Co.); Davis Blowout Cave (Blanco Co.); Beaver Creek Cave (Burnet Co.); and James River Bat Cave (Mason Co.).

Bracken Cave is fairly representative of the others which harbor multimillions of bats. Its bat colony is estimated to be around 15 million during the summer months. The entrance is located in a bowl-like depression on a rocky plateau in the midst of cedar, live oak, and prickly pear trees. The cave opening is about 40 ft. wide and 15 ft. high. Inside the entrance, there is a steep decline to the cave floor. The cave proper, a single chamber, is approximately

100 ft. wide and 1,000 ft. long, with the ceiling reaching an estimated 75 ft. in height in places. The ceilings and walls are deeply eroded, furnishing many footholds and chambers to accommodate bats. The floor of the cave is strewn with fallen rocks. When the bat population is at a seasonal peak, the guano is so deep that walking becomes difficult. The average yearly harvest of guano from this cave, in December and January, is some 60 tons. A peculiar pungent odor, heavy with ammonia and characteristic of the Mexican free-tailed bat, permeates the cave and can be detected a considerable distance from it.

Occupancy of these caves by *T. mexicana* shows marked seasonal fluctuation. There are no discernible bats present from the latter part of November until February. Toward the end of February, the first few thousand bats arrive and the numbers increase steadily until May, then remain comparatively constant until the young arrive, from late June to August. The young mature sufficiently to join the evening flights in August. The fall exodus begins in September, with the colony size fluctuating most in October as migrants from more northerly areas stop.

To obtain information concerning *T. mexicana* migratory activities as well as other life history data, in 1954-1955, 13,700 *T. mexicana* and 1,900 *Myotis velifer* were banded. Summer recoveries of banded bats have been numerous but there is no conclusive evidence as to where the free-tailed bats spend the winter months. Data indicate a considerable amount of colony integrity, that is, many of the bats remain in the same cave throughout the summer and return to it after a winter's absence.

During this study, the many parasites and predators of the free-tailed bat in the large cave populations were catalogued. Especially striking was the prevalence of dermestid beetles, the voracious scavengers which skeletonize a fallen bat in minutes. Their numbers attest to a high bat mortality. A variety of internal parasites were recovered, although the free-tailed bat has seldom been found to be heavily burdened.

Field investigations involving entry into bat caves in Central Texas proved unexpectedly hazardous when a worker died of rabies presumably contracted in the course of cave work, although there was no history of a bite by a bat or other animal bite. It was suspected that the portal of entry of

the virus was an abraded area due to a fungus infection on the worker's neck. Since then, prolonged exposures of personnel to caves have been curtailed and all who have occasion to work with rabies virus or animals which might be rabid have first been inoculated with avianized rabies vaccine\* (3 doses of 0.2 ml., intradermally at weekly intervals, with a fourth inoculation 6 mo. later). Although vaccinated individuals have developed a rise in titer, the correlation of the resistance demonstrated by this titer to a given challenge of rabies has not been ascertained.

The public has been advised that bats, like foxes and skunks, with altered behavior should be avoided. Of the bat bites in ten persons in Texas, reported to us in 1955-1956, all, with one possible exception, resulted from the handling of sick animals and not from unprovoked attacks.

#### CHARACTERISTICS OF BAT RABIES VIRUS

To determine some of the characteristics of the rabies virus isolated from bats, mice were inoculated intracerebrally with the virus. After an incubation of five to eight days, the course was rapid, with death following periods of hyperexcitability and convulsive seizures. Lingering paralysis prior to death was not observed as often as in mice inoculated with street rabies virus.

Three raccoons trapped near the entrance of a bat-inhabited cave and inoculated intramuscularly with the virus (a 25,000 l.d.<sub>50</sub>-dose each), failed to develop the infection. Serum collected from the raccoons prior to inoculation was capable of neutralizing 10 l.d.<sub>50</sub> of the virus. Shortly after injection, 1 of the 3 raccoons died of pneumonia; the remaining 2 were bled at 17 days and seven months postinoculation. Neutralizing antibodies had increased in 1 of the raccoons at 17 days, but returned to the original level at seven months. The other raccoon failed to show evidence of neutralizing antibodies. Both were destroyed seven months after injection. Suspensions of brain and salivary gland tissues from these animals were inoculated into mice and did not reveal rabies virus.

Since these raccoons could have come in contact with bats, the original protective level of neutralizing antibodies in the serum may be of significance.

Another experiment was conducted using

3 dogs, 12 weeks old, none of which exhibited neutralizing antibodies prior to inoculation. Bat rabies virus (approximately 300,000 l.d.<sub>50</sub>) was given each animal intramuscularly. One dog developed typical symptoms of rabies on the eleventh postinoculation day and died in 48 hours. Rabies virus was isolated from the dog's brain but not from the salivary glands. Negri bodies were found in inoculated mice; the virus was again identified by the neutralization test.

The other 2 dogs remained well and were later destroyed at 35 and 65 days postinoculation, respectively. Neutralizing antibodies were present in the serums of both. That of the dog destroyed at 35 days neutralized 1,000 l.d.<sub>50</sub> of rabies virus. The serum of the other dog which was bled on the same day neutralized 10,000 l.d.<sub>50</sub>; this had dropped to 1,000 l.d.<sub>50</sub> when the dog was destroyed.

#### SUMMARY

Studies indicate that bat rabies virus is infectious and invasive in other mammalian species, including man.

### Bat Rabies—Report of an Isolation of Rabies Virus from Native Ohio Bats

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Rabies infection in vampire bats, as well as bite transmission of the disease from such bats to other animals, has been recognized as an economic and, to a lesser degree, a public health problem for many years in various Central and South American countries.<sup>1</sup> Bat rabies has been recognized in this country for slightly more than three years. During this period, a great deal of consideration has been given to this problem for two reasons: (1) it has become apparent that bats other than the vampire type are capable of acquiring, harboring, and transmitting the virus, and (2) prog-

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The authors thank the laboratory personnel of the Division of Laboratories, Ohio Department of Health, Columbus, for their technical assistance.

\*Produced by Lederle Laboratories, Pearl River, N. Y.



ress in the control and epidemiology of rabies in other animal species has forced a consideration of the possibility of the existence, somewhere in nature, of an unrecognized link in the infection-transmission chain.

As early as 1911, during an investigation<sup>2</sup> of an epizootic paralytic disease of cattle in Brazil, an intimate relationship was suspected between the bovine disease, indigenous vampire bats, and rabies infection. Negri bodies were demonstrated in the brain tissues of cattle that died from this unidentified disease. Epidemiological evidence incriminated the vampire bat as the vector. Rabies virus was isolated from an insectivorous bat in Brazil as early as 1916.<sup>3</sup> In Trinidad, in 1929, an epidemic of fatal paralytic myelitis in man was found<sup>4</sup> due to infection with rabies virus. As before, epidemiological evidence pointed to the vampire bat as the transmitting agent. In 1936, the vampire bat was proved<sup>5</sup> capable of transmitting rabies to other animals. Investigations<sup>6</sup> of a paralytic disease of cattle in Mexico resulted in the identification of the rabies virus as the etiological agent. The vampire bat was identified as the vector.

Bat rabies was first reported in this country in 1953 by the Florida State Board of Health,<sup>7</sup> following an unprovoked attack on a young child by an insectivorous bat found to be Negri body-positive. The rabies virus was identified by mouse inoculation and serum-virus neutralization tests. Subsequent surveys of Florida bats have resulted in additional isolations. Since the original Florida work, bat rabies has been reported in Texas, Montana, Pennsylvania, and California and, more recently, in Georgia, Oklahoma, Utah, Alabama, Louisiana, and New Mexico.

To delineate this problem geographically, a survey was made of native Ohio bats. Sixty-three *Eptesicus fuscus*, commonly known as the big brown bat, were selected at random from a hibernating colony during January, 1955, in the central Ohio area. This is a colonizing, insectivorous type of bat.

#### TESTS FOR RABIES VIRUS

The bats were bled, and the blood samples pooled in groups of three. It was not possible to secure adequate blood samples from all the animals. The pooled samples were tested for neutralizing ability against standard rabies virus. In only one instance was there evidence of such activity. In this case, the neutralizing ability of the serum was incomplete and it was not possible to obtain a clear end point.

After the animals were bled, the brains were removed and smears were made for Negri body examination. All brain smears made directly from bat brains were found to be negative. The brains were then pooled in groups of four and ground with saline to a final concentration of 10 per cent. The sixteenth brain pool was of necessity a 3-bat pool. Four white mice were injected intracranially with 0.03 cc. of tissue suspension from each pool.

This first series of mice was observed for 25 days, then killed and the brains removed. Five first-passage mouse brains were then ground and 0.03 cc. inoculated intracranially into each of 3 second-passage mice. These second-passage animals were observed for 25 days, then killed and the brains removed. As before, five second-passage brains were processed and inoculated into 3 third-passage mice. The third-passage mice were observed for 40 days and then discarded. The 5:3 mouse transfer ratio was decided upon after consideration of virus-dilution factors, animal costs, and housing facilities.

At each transfer in the three passage-mouse series, brain smear slides were made from mice selected at random. In all instances, other than in group 16 from which virus was isolated, mouse brain smears were found to be Negri body-negative. Brain smears were made from all mice which died more than three days following inoculation.

Two mice of a first-series passage group died 21 days after inoculation. These mice were positive on Negri body examination. The remaining 2 mice in this passage group died five days later and were found to be Negri body-negative. This particular group of mice had been inoculated with material from the single 3-bat brain pool. Two white rats were inoculated intracranially with 0.08 cc. and 0.05 cc. of a 10 per cent brain tissue suspension from this group of mice. These animals died in 18 and 19 days, respectively. Each evidenced classic symptoms of paralytic rabies several days prior to death. One rat was found to be Negri body-positive.

Standard serum-virus neutralization techniques were employed to prove the identity of the isolated agent. Commercial hyperimmune guinea pig anti-rabies serum was used in these tests. Infected brain tissue was ground with 10 per cent inactivated rabbit serum-saline to a final concentration of 10 per cent, and 1,000 units of soluble sodium penicillin G and 2 mg. of streptomycin were added to each milliliter of tissue suspension. The first serum-virus neutralization test was inconclusive because the  $L.D_{50}$  of the virus titered out at  $10^{-2.4}$ . As set up, it resulted in excess serum protection and, consequently, 68 rather than the classical 100  $L.D_{50}$  were neutralized. In an effort to enhance the virulence of the virus, it was rapidly passed intracranially through a series of five mice. A standard block serum-virus neutralization test was then performed, using the serially passed virus. In this test, the  $L.D_{50}$  of the virus titered at  $10^{-4.0}$ . Serum diluted 1:10 neutralized 1,120  $L.D_{50}$  of virus, thereby establishing the identity of the isolated agent. The fact that virus was recovered from the single 3-bat pool may be of consequence since the isolated virus was not characterized as being particularly virulent.

In all phases of this study, negrigenesis remained at approximately 50 to 60 per cent. This rate maintained itself when the virus was rapidly passed by serial transfer through mice. After isolation of the virus, the original bat brain smears from the positive group were reexamined to demonstrate Negri bodies. None were found.

### RABIES VIRUS IN BATS

Little is known of the pathogenesis of rabies in bats. The fact that rabies virus can be isolated from apparently normal bats has been demonstrated repeatedly. Likewise, both paralyzed and abnormally furious bats have yielded rabies virus on examination. Pawan<sup>6</sup> classified rabies infection in vampire bats into six distinct types ranging from the fatal furious and paralytic forms to nonfatal subclinical and clinical infections followed by recovery. Vampire bats experimentally infected with bovine rabies virus have been known to remain infective without evidence of disease for one to five and one half months.<sup>6</sup> On the basis of present evidence, the paralytic form of the disease would appear to be by far the most common type transmitted by bats. However, laboratory studies and field experience indicate that bat rabies virus can induce furious rabies in other animal species.<sup>7</sup> Vaccination of domestic animals against vampire bat-transmitted rabies is considered effective. Field trials in Mexico<sup>4</sup> indicate that the avianized type of vaccine is considerably more effective for this purpose than the phenolized product.

Surprisingly little is known of the ecology of the bat. Such information is prerequisite to an epidemiological evaluation of this problem. Studies of this nature are costly, time consuming, and exceedingly difficult. Work is now in progress on both the disease in bats and the bats themselves. The possibility of bat rabies being a key factor in over-all rabies control can not be overlooked.

A clarification or understanding of the host-parasite relationship existing between the bat and the rabies virus may well have a profound effect on our conception of rabies as an infectious disease.

#### References

- <sup>1</sup>Hurst, E. W., and Pawan, J. L.: An Outbreak of Rabies in Trinidad. *Lancet*, 2, (1931): 622-628.
- <sup>2</sup>Pawan, J. L.: The Transmission of Paralytic Rabies in Trinidad by the Vampire Bat. *Ann. Trop. Med.*, 30, (1936): 101-130.
- <sup>3</sup>Courter, R. D.: Bat Rabies. *Pub. Health Rep.*, 69, (1954): 9-16.
- <sup>4</sup>Johnson, H. N.: Derriengue: Vampire Bat Rabies in Mexico. *Am. J. Hyg.*, 47, (1948): 189-204.
- <sup>5</sup>Official U.S. Public Health Service: Release, C.D.C., Atlanta, Ga., 1954.
- <sup>6</sup>Pawan, J. L.: Rabies in the Vampire Bat of Trinidad with Special Reference to the Clinical Course and Latency of Infection. *Ann. Trop. Med.*, 30, (1936): 401-422.
- <sup>7</sup>Van Rooyen, C. E., and Rhodes, A. J.: *Virus Diseases of Man*, 2nd ed. Thomas Nelson and Sons, New York (1948): 792.

### Rabies in the Union of South Africa

Rabies had not been present in the North Transvaal area until June, 1950. Dogs and jackals were the main carriers. Quarantine and a reduction of the dog population by 60 per cent, with fine cooperation of the natives, turned the tide. Control was simplified in June, 1952, by a program of vaccinating all dogs over 5 months old—over 70 per cent of the 15,532 with egg-adapted Flury virus (only 3 of these have developed rabies). All new dogs are routinely vaccinated but, if rabies occurs, all dogs in the area are revaccinated.

The reduction of jackals presented a new problem. Normally they hide during the day and hunt, usually in pairs, in the late afternoon and evening. Families or groups have their own hunting areas and they follow roads or footpaths and avoid the long grass until a scent is picked up. When animal carcasses were dragged along these trails, then left with traps set around them, only 2 jackals and 1 genet cat were caught in 18 days with 966 traps. The jackals followed the "drags" but turned away when they reached the traps.

Poison baits were more effective. They were freshly prepared (1-in. cubes of raw meat with ½ gr. of strychnine in the center) and dropped along the drag marks each afternoon—2 baits at 350-yard intervals. The next morning, the baits not consumed were picked up and the number of jackals present was estimated from their tracks. The stomachs of poisoned animals contained an average of 2 baits so the number killed was estimated by halving the number of baits taken. In all, carcasses were dragged a total of 2,067 miles, 21,020 poison baits were placed, 7,917 were eaten by jackals (978 by other animals), 515 dead jackals were found, and an estimated 3,900 were killed, reducing the population to less than 1 per mile and effectively breaking the contact chain.

In 1950, rabies was confirmed in 18 dogs, 3 jackals, 2 donkeys, 1 cow, and a native child. For nearly three years after July, 1951, confirmed cases were few but there were 6 in 1954, 4 in 1955, and 3 in the first half of 1956, about half of them dogs.—*J. South Afric. V.M.A.*, Sept., 1956.

Rabies does not occur in much of the Pacific area from and including Hawaii to New Guinea, New Zealand, and Australia.—*Science*, Dec. 7, 1956.



## Closed Circuit Television at the AVMA Meeting in San Antonio—October 15-18, 1956

Coordinator of Television Programs—Dr. L. E. Fisher, Berwyn, Ill.

The closed circuit televised portions of the section programs were made possible by the generous support of Allied Laboratories, Inc., in cooperation with Radio Corporation of America.

### RESEARCH SECTION

Dr. N. B. King, Wooster, Ohio, explains the use of paper electrophoresis in the study of the immunological response. ➤



### GENERAL PRACTICE — SURGERY AND OBSTETRICS SECTIONS

Drs. L. C. Faulkner (kneeling) and H. J. Hill (right), of Fort Collins, Colo., demonstrate and explain the technique of electroejaculation in the bull.





#### SMALL ANIMAL SECTION

Dr. J. E. Greene, Auburn, Ala., demonstrates the technique used in the treatment of deformed tails in small animals. Dr. Fisher, television coordinator is at the left.

#### Closed Circuit Television at San Antonio

#### SMALL ANIMAL SECTION

Dr. L. C. White, San Bruno, Calif., demonstrates the technique used for implants for defective cartilages in cropped ears. >



#### SMALL ANIMAL SECTION

Dr. H. A. Gorman (right), at San Antonio, installs a complete prosthetic hip joint in the dog. Dr. R. L. Rudy (left), Columbus, Ohio, assists him. Dr. Fisher and Dr. Jack Knowles, of Miami, Fla., are in the background.

## Closed Circuit Television at San Antonio

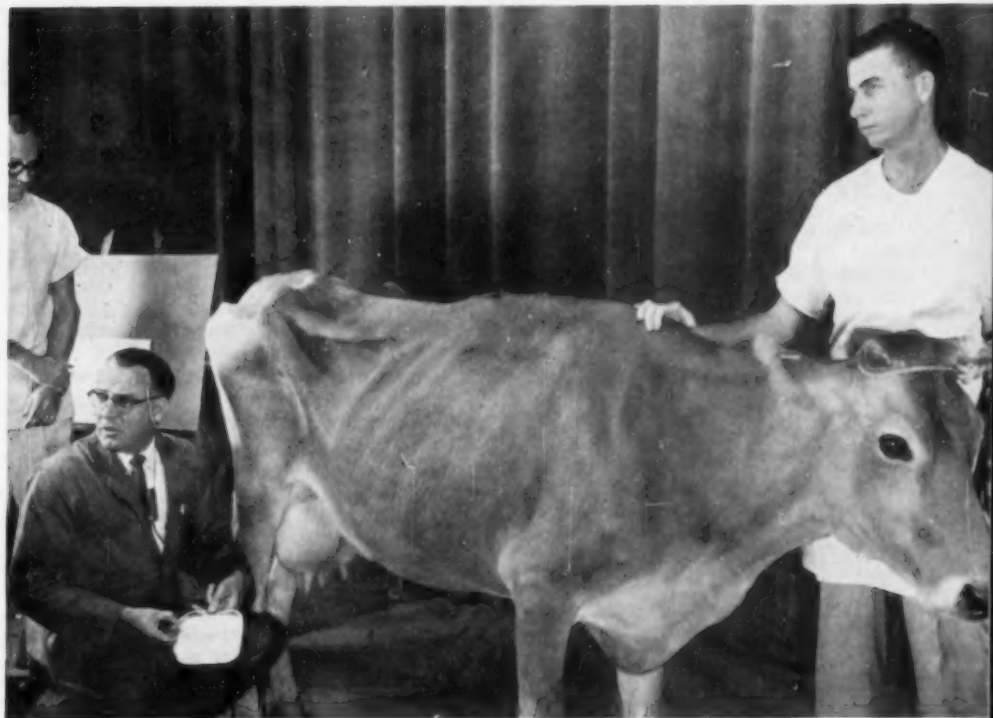


### GENERAL SESSIONS

Dr. W. C. Banks, College Station, Texas, collects urine (left) and blood (above) for clinical laboratory tests.

### GENERAL SESSIONS

Dr. O. W. Schalm (kneeling), Davis, Calif., explains the application and the interpretation of the California mastitis test.



## U. S. Livestock Sanitary Association—1956 Meeting

The sixtieth annual meeting of the U.S.L.S.A. was held in the Morrison Hotel, Chicago, on Nov. 28-30, 1956, with Dr. A. L. Brueckner of Baltimore, Md., presiding.

The officers elected for 1957 are Drs. G. H. Good, Cheyenne, Wyo., president; J. Milligan, Montgomery, Ala., first vice-president; H. U. Garrett, Des Moines, Iowa, second vice-president; and Mr. F. G. Buzzel, Augusta, Maine, third vice-president. Dr. Ralph A. Hendershott of Trenton, N. J., was again re-elected as secretary-treasurer.

**Anaplasmosis.**—Attempts to control this disease by means of the complement-fixation test were reported. In Hawaii, where it appeared in May, 1954, it was eliminated by the test and slaughter method from 23 herds (4,500 cattle).

In a Montana beef herd, since 1953, 19 of 333 animals have reacted; 9 were removed but 10 were treated with oxytetracycline and were negative to the test eight months later. In a Virginia herd, when 47 (28%) of 164 cattle reacted, in 1953, 35 were retained as an isolated herd except in the winter when isolation was not possible. The heifer calves of infected cows were retained and eventually all original reactors were sold, leaving a negative herd of 178 animals without purchasing replacements. Results in other herds are incomplete.—*T. O. Roby, et al., Beltsville, Md.*

**Bacillary Hemoglobinuria.**—This disease, caused by *Clostridium hemolyticum*, was controlled for several years, in parts of Montana, by routine vaccination, but it recurred when vaccination was discontinued. In other areas, vaccination was not uniformly effective; it reduced the infection but, when used alone, did not eradicate the disease.—*L. D. S. Smith, Bozeman, Mont.*

**Infectious Rhinotracheitis.**—A vaccine for this bovine disease was produced by growing the virus, which produces cytopathogenic effects, in tissue cultures.—*C. J. York, Indianapolis, Ind.*

This vaccine was tested, under feedlot conditions, on young Hereford cattle in California. After 23 days, the 20 animals given 2 cc. of vaccine had developed specific antibodies and resisted severe infections when challenged by means of a nasal spray, whereas the contact control animals had

developed no antibodies and after challenge had a fever (106 F.) in about four days but recovered by the eleventh day.—*J. W. Kendrick, Davis, Calif.*

**Infectious Diseases of Cattle** (Committee Report).—The progress made in eradicating bovine tuberculosis and brucellosis opens the way for similar efforts on other diseases.

Mastitis can not be eradicated, but better control is urgently needed. Many herds have been freed of *Streptococcus agalactiae* infection in six months.

*Vibrio fetus* infection has been spread widely by movement of bulls. Glycerin used to preserve semen may also preserve vibrios.

Virus diarrhea and like diseases may cause abortions at any stage of pregnancy. In 1956, virus diarrhea or mucosal disease was reported from 24 states and infectious rhinotracheitis from at least 15 states.

An immunizing agent for shipping fever would be welcome when the cause is established.

The etiology of interdigital necrosis (foot rot) deserves study.

*Leptospira pomona* vaccines merit increased use.—*M. G. Fincher, Chairman, Ithaca, N. Y.*

**Port of Entry Inspection** (a Few Interesting Excerpts).—All imported animals are held in isolation for at least 15 days. +Most hides are disinfected; sun-dried skins and sheep pelts rarely require disinfection. +All garbage removed from ships is cooked and all refuse (including straw or hay used for packing dishes) is incinerated. +On several occasions, infections developed in game birds and the entire lot was destroyed. +Sausage and other special meats carried in by individuals are destroyed (160,000 lb. in some years). +Four ticks of a new species were found on a rhinoceros several weeks after arrival (fortunately all were of 1 sex).—*F. L. Herchenroeder, Fort Worth, Texas (formerly in charge at New York).*

**Crystal Violet-Glycerol Hog Cholera Vaccine.**—This vaccine is produced by adding one part of the preservative (crystal violet 1, glycerol 500) to four parts of blood from a hog with cholera. The results of 12 years of local field tests (1943-1955) were reported. The pigs were vaccinated at an

average age of 12 weeks (6.7 to 9.0 weeks since 1952), and the immunity of a few from each herd was challenged with an injection of virus when they weighed 70 to 360 (av. 230) lb. In several years, all survived challenge. Of the 12,167 vaccinated, 523 were challenged and 41 died from cholera; this included the 1954 pigs, half of which became ill when challenged and 17.2 per cent of which died. These pigs had been vaccinated before being weaned and their dams had previously been immunized with virulent virus and serum.

Reports from 175 practitioners who used this vaccine in field experiments in eight states over a period of eight years (49,950 pigs) indicated that no postvaccination reactions and no cholera occurred in these herds.—J. P. Torrey, et al., Ames, Iowa.

**Eradication of Hog Cholera** (Committee Report).—Eight states (Alabama, Georgia, Louisiana, Mississippi, Montana, North Dakota, Tennessee, and Wyoming) have now outlawed the use of virulent virus for vaccination. Of all pigs vaccinated in the United States in 1956, it is estimated that 28 per cent were vaccinated with virulent virus and serum; 45 per cent with modified virus with serum; 25 per cent with modified virus without serum; and 5 per cent with inactivated virus vaccines.

The committee recommended that action be initiated for the eradication of hog cholera. The following were among the steps urged:

- 1) Establish a hog cholera eradication section in the Animal Disease Eradication Branch of the Agricultural Research Service of the U.S.D.A.

- 2) Provide the necessary funds.

- 3) Ban the use of virulent virus (except in federally controlled agencies) not later than Jan. 1, 1958.

- 4) Discontinue the use of virulent virus at stockyards and sale barns as soon as possible.

- 5) Stop the feeding of uncooked garbage in the entire country (now effective for 91 % of garbage feeding).

- 6) Make hog cholera a reportable disease.—J. G. Milligan (Chairman), Montgomery, Ala.

**Poultry Diseases** (Committee Report).—There was more ornithosis, less hemorrhagic disease, and little change in other poultry diseases during 1956. It was recommended that a poultry disease eradication section be established in the Animal Disease Eradication Branch of the ARS, U.S.D.A.—M. S. Hofstad (chairman), Ames, Iowa.

**Chronic Respiratory Disease.**—A serological test for the PPLO was used on 300,000 chickens in New Hampshire with some success but it was concluded that it will be some time before the test is as accurate as that for pullorum disease.—W. R. Dunlop, Durham, N. H.

**Infectious Bronchitis.**—There are at least two types of the virus. The course of the experimentally induced disease is about 21 days. Histological examination of the tracheal mucosa is a more accurate means of identifying the disease than are symptoms.—E. R. Jungherr, et al., Storrs, Conn.

**Encephalomyelitis in Pheasants.**—An epizootic on one New Jersey breeding farm, in October, 1956, was described. Of birds vaccinated two weeks prior to exposure, 87.5 per cent survived; of the well birds vaccinated after exposure, 73.9 per cent survived; and in two unvaccinated control lots, 30.7 and 38.4 per cent survived.—H. Cohen and O. Sussman, Livingston and Princeton, N. J.

**Rabies** (Committee Report).—Rabies virus has been isolated from 170 bats in 14 states since June, 1953—1 a baby (suckling) bat in Florida. In 1946, when the most cases (10,872) were reported in the United States, 8,384 were in dogs, 956 were in wild or miscellaneous animals, and 22 were in man; in 1955, of 5,844 cases, 2,657 were in dogs, 1,915 were in wild or miscellaneous animals; and 5 were in man.—V. D. Chadwick (chairman), Jackson, Miss.

In Georgia, there has been an intensive campaign against rabies for ten years. The number of positive cases has been reduced from 1,468 in 1946 to 81 in 1956. Foxes were nearly eliminated by the natural disease in 1945. Mass vaccination of 10,000 dogs with egg embryo vaccine in 1949 resulted in only seven failures (4 positive). There were only 19 canine cases in 1956. Wildlife rabies may not be eradicable.—L. E. Starr, et al., Atlanta, Ga.

**Atrophic Rhinitis.**—When rats were infected with material from infected swine, they developed lesions similar to those in swine but with a greater pus formation. When material from these rats was sprayed into the nasal cavities of 36 young pigs, 23 developed typical signs of the disease in 15 to 75 days.—J. S. Andrews, et al., Beltsville, Md.



**Summary of Brucellosis Regulations (NOT a Regulation)**  
**For Detailed Information Relative to Each Type of Interstate Movement, Refer to the Regulation in the July 12, 1956, Federal Register**  
**(21 R 5183)**

Class of cattle	Requirements to move into	
	Modified certified brucellosis-free areas	All other areas
1. Steers, spayed heifers, and calves under 8 mo.	None.	None.
2. Cattle from brucellosis-free herds and areas.	Official certificate.	Official certificate.
3. Officially vaccinated cattle under 30 mo. of age.	Official certificate and a permit from livestock sanitary official of state of destination.	Official certificate.
4. Officially vaccinated cattle over 30 mo. of age.	Must be tested within 30 days prior to interstate movement and not react over incomplete at 1:100. Permit from state of destination and an official certificate required. Quarantined until negative or slaughtered.	Tested within 30 days of shipment and not react over incomplete at 1:100. Permit from state of destination and an official certificate.
5. Unvaccinated cattle over 8 mo. of age.	Negative blood test within 30 days of shipment. Permit from state of destination and an official certificate. Quarantined at destination until negative after 30 days, or slaughtered. If from a herd under federal-state supervision and the herd has been blood-tested within past 90 days with no reactors, the animals can move without permit and quarantine, providing each has been negative on two tests 30 days apart, the second test being within 30 days of shipment. An official certificate is required.	Negative blood test within 30 days of shipment plus official certificate.
6. Bulls and female cattle of beef type moved for feeding or grazing purposes only.	Can be moved under an official certificate and a permit from livestock sanitary official of state of destination if that state has laws, rules, or regulations providing for the segregation and quarantine of such cattle.	Can be moved under an official certificate and a permit from livestock sanitary official of state of destination if that state has laws, rules, or regulations providing for the segregation and quarantine of such cattle.
7. Reactors (CFR Amendment 56-40).	Direct to slaughter at federally inspected plant or one specifically approved by U.S.D.A. or to a public stockyard for sales to such a slaughtering establishment, with "B" brand on left jaw and metal reactor tag in left ear. Official certificate required.	Direct to slaughter at federally inspected plant or one specifically approved by U.S.D.A. or to a public stockyard for sales to such a slaughtering establishment, with "B" brand on left jaw and metal reactor tag in left ear. Official certificate required.
<i>Movement of cattle for immediate slaughter</i> —Direct to slaughter at federally inspected plant or one specifically approved by U.S.D.A. if accompanied by a waybill or similar document, or a certificate signed by the owner or shipper of the cattle.		
<i>Movement of cattle to public stockyards</i> —Direct to a public stockyard or one specifically approved by U.S.D.A. if accompanied by a waybill or similar document, or a certificate signed by the owner or shipper of the cattle.		

CONSULT APPROPRIATE STATE OFFICIAL FOR STATE OF DESTINATION REQUIREMENTS



**Swine Diseases (Committee Report).—** Replies from veterinary officials in 45 states indicate that nearly 1.5 million swine were moved interstate in a year, in 28 states, for purposes other than slaughter. Of the 42 states that required the cooking of garbage, 39 reported that this had considerably reduced a number of infections.

Compared with 1955, the states reported the incidence of diseases as follows: cholera—more in 6 states, no change in 14, less in 22; erysipelas—more in 13, no change in 21, less in 6; atrophic rhinitis—more in 15, no change in 23, less in 2; transmissible gastroenteritis—more in 3, no change in 21, less in 4; enteritis—more in 6, no change in 22, less in 4; leptospirosis—more in 4; respiratory diseases—more in 8, no change in 23 states. Eperythrozoonosis was recognized in 17 states; it is becoming a major problem in some.—*H. U. Garrett (Chairman), Des Moines, Iowa.*

**Biological and Pharmaceutical Agents (Committee Report).—**No new immunological agents were licensed in 1956, although several were improved. In general, the use of immune serums declined; several were discontinued, including several types of botulinus antitoxin and anti-*Clostridium hemolyticum* serum. Avirulent vaccine for swine erysipelas seemed to produce an immunity of satisfactory duration, often until marketing age.

Vaccines for bovine leptospirosis seemed to be satisfactory. Over 2 billion doses of poultry vaccines are used annually. It was recommended that race horses be vaccinated for both eastern and western encephalomyelitis.

Pharmaceutical agents form a second line of controls. As used in poultry flocks, some have reduced certain infections until they are not transmitted. Piperazine salts have proved of value as anthelmintics, especially for ascarids. Of the insecticides, lindane is the most satisfactory; none has yet been approved for internal administration.—*H. Marsh (chairman), Bozeman, Mont.*

### Action Against Brucellosis

In Florida, ten meat-packing plants have been taking blood samples from beef cows and bulls when they are slaughtered. Of 8,351 tested for brucellosis at a state laboratory in the past six months, 858 (10.3%) were reactors and 309 (3.7%) were suspects. When possible, the reactors

are traced to their source and the herds are tested.

In Alabama, under a new program, 67 herds of purebred swine have been certified after three successive negative tests for brucellosis at 60- to 90-day intervals. Another 100 herds have had one or more blood tests. This service is furnished without charge by the state department of agriculture under the supervision of a full-time veterinarian.—*Progressive Farmer, Dec., 1956.*

### A Step in Brucellosis Eradication

Washington became the fourth state to achieve a modified, certified brucellosis-free status. Since the program was started in 1934, 4 million cattle were blood-tested, 760,000 calves vaccinated, and more than 146,000 reactors removed. In the nation, since 1934, nearly 159 million cattle had been blood-tested, 30 million calves vaccinated, and more than 3.5 million reactors removed at a cost to the federal government of a little over \$155 million.

Among other costly diseases, estimated annual losses are: for mastitis, \$226 million; shipping fever, \$25 million; anaplasmosis, \$9.5 million; atrophic rhinitis in swine, \$14 million; and vibriosis in cattle and sheep, \$145 million. Losses have not been estimated for other important diseases.—*M. R. Clarkson, U.S.D.A., Sept. 17, 1956.*

Two cases of anthrax in man were reported from California. A veterinarian and his helper had been infected while doing a necropsy on 2 cows.

Leptospirosis was suspected in a packing-house worker in Missouri when serological tests for typhoid fever, brucellosis, and tularemia were negative. He was found to have a titer of 1:512 for *Leptospira pomona*, then responded favorably to treatment with streptomycin and penicillin.—*Pub. Health Serv., Nov. 29, 1956.*

Three men were fined \$10 each for moving cattle without health certificates. If they had been charged with bacteriological warfare, it would have been considered a crime against mankind with, perhaps, a long prison term. "How ridiculous can we be in the administration of justice?"—*Editorial, Hoard's Dairyman, Nov. 25, 1956.*

## The Use of Kirschner Wires in Maintaining Reduction of Dislocations of the Hip Joint

JOHN L. DURR, D.V.M.

Jackson, Mississippi

OPERATIONS have been described<sup>1-5</sup> which are designed to maintain the reduction of luxations of the hip joint where the figure-8 bandage, alone or combined with other measures such as bruising or injection of irritating drugs, will not suffice. Each has its advocates who report excellent results; however, most practitioners consider as hopeless any hip dislocation not responsive to conservative treatment. A surgical procedure that can be successfully performed with a minimum of specialized equipment, assistance, skill, and time is herein described.

### PROPOSED OPERATION

Over 90 per cent<sup>6</sup> of all hip dislocations in the dog are of the superoanterior type. Obviously, when these are reduced, relaxation could be prevented if the acetabular rim could be sufficiently extended laterally. With this in mind, the author began experimenting with Kirschner wires inserted over the trochanter major into the bone forming the roof of the acetabulum. Pins thus placed pass through the hip joint; however, transarticular pin fixation has been used in medicine since 1935.<sup>6-8</sup>

### EXPERIMENTAL LUXATIONS

In order to evaluate the proposed surgical procedure, it was necessary to create hip luxations, which were irreparable using conservative methods. After trying several methods, such luxations were produced in 10 of 11 dogs when the deep gluteal, internal obturator, and gemelli muscles, as well as the joint capsule and round ligament, were severed.

Dr. Durr is now base veterinarian at Donaldson Air Force Base, Greenville, S. Car.

A television demonstration of this operation was presented by Dr. Durr at the Forty-Ninth Annual Conference for Veterinarians, Alabama Polytechnic Institute, Auburn, July 22-25, 1956.

The author thanks Drs. James A. Gaskin and Edward P. Calvin who, while senior students at Alabama Polytechnic Institute, assisted with the experimental operations herein reported.

Figures 1 and 2 are from Malcolm E. Miller's "Guide to the Dissection of the Dog." Edwards Brothers, Ithaca, N.Y., 1947.

### REPAIR TECHNIQUE

A skin incision  $\frac{1}{2}$  to 2 inches long, depending on the size of the dog, is made directly over the trochanter major and parallel to the anterior border of the femoral shaft. The incision is deepened through the subcutaneous tissue until the anterior margin of the biceps femoris is identified (fig. 1). The biceps and tensor fasciae latae are then separated with scissors and each is reflected, bringing into view the trochanter major (fig. 2). The luxation is reduced and two threaded Kirschner wires, 3 inches long, are inserted over the trochanter and head of the femur into the acetabular roof (fig. 3, 5). Wire A (fig. 3) is passed over the summit of the trochanter major and wire B is passed cranioventral to the summit of the trochanter and under wire A.

Proper insertion of the wires is not difficult if the following technique is employed. With the anesthetized dog in lateral recumbency, the head of the femur is relocated and the limb is adducted so that it rests on the table. This lowers the trochanter major, allowing wires to enter the thick dorsal wall of the acetabulum (fig. 5). If the femur is not adducted, the trochanter may be elevated to the extent that the wires are directed ventrally into a thin area of the acetabular wall (fig. 4). Wire A must be in direct contact with the summit of the trochanter with no muscle interposed, if dorsal movement of the femur and redislocation are to be prevented. It is passed over the trochanter medially until it makes contact with the pelvic bone and is thought to be just under the superolateral acetabular rim. If the point of the wire is properly seated under the rim of the acetabulum, it will remain there when firm ventral pressure is applied to the free outer end of the wire. The wire is then ready for insertion. However, if the point of the wire moves dorsally when ventral pressure is applied to its free outer end, it must be reinserted.

When properly seated, a Kirschner-type hand drill is attached and wire A is drilled



Fig. 1—Superficial musculature of the canine leg; biceps femoris (A) and tensor fasciae latae (B).



Fig. 2—Biceps femoris (A) reflected posteriorly and tensor fasciae latae (B) reflected anteriorly.

dorsomedially until its point penetrates the medial surface of the pelvis (fig. 5), as determined by rectal examination. It is important that the point of the wire be inserted under the rim of the acetabulum before a hand drill is attached because, with the drill attached, the surgeon's sense of touch, necessary to properly position a wire, is largely lost. Wire B is then similarly inserted cranioventrally to the summit of the trochanter beneath wire A into the roof of the acetabulum (fig. 3).

The femur must be held firmly in place while the wires are inserted, otherwise, instead of penetrating the acetabular rim, the wires may slip down into the acetabulum, forcing the head of the femur partially out of place (fig. 4).

The incision is closed by placing a few interrupted sutures in the fascia between the biceps femoris and tensor fasciae latae and in the skin. The wires may be cut off beneath the skin or left protruding. Finally, while firm medial pressure is being applied to the trochanter, a loose figure-8 bandage is applied. A radiograph is taken to be sure the head of the femur is properly seated in the acetabulum.

The wires are left in place about 12 days and the figure-8 bandage for two or three additional days.

Several points in the technique should be emphasized. Wire A, in passing over the summit of the trochanter, penetrates the strong tendinous insertions of the gluteal muscles. Passage of the wires through the tendinous muscle insertions insures that the trochanter can not slip to one side of



Fig. 3—Wires properly placed (A) over summit of the trochanter and (B) cranioventral to the summit of the trochanter.



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Fig. 4—Cross section showing improperly placed pin penetrating thin area of the pelvis; the result of not applying medial pressure to the trochanter while inserting the pin, or of the leg not being in slight adduction while inserting the pin, or both.

the wire, allowing the femur to move dorsally and dislocate. Wire B is inserted simply as a safety factor and may be unnecessary in most cases. Both wires A and B prevent dislocation of the hip by exerting ventral pressure on the trochanter major and the head of the femur (fig. 3, 5).

Both wires are inserted into an area of the pelvis which structurally resembles the shaft of a long bone and, thus, has great holding power (fig. 5).

#### EXPERIMENTAL RESULTS

**Dislocations.**—Ten experimentally dislocated hips, that could not be held in place with figure-8 bandages, were treated with the described technique. All of the dogs

were of medium size (20-25 lb.). All ten dislocated hips remained in place following wire fixation; however, complications occurred in 2 dogs. In 1, wires of insufficient diameter were used and one wire broke flush with the bone. The leg was used normally two weeks after the wire broke and, after euthanasia, the pin was found to be causing no trouble. In the other dog, a non-threaded wire migrated into the pelvic cavity and had to be removed by laparotomy. The 10 animals were placed together in an outside pen the day following surgery. Had they been closely confined in separate cages, it is doubtful that either of the complications would have occurred.



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Fig. 5—Cross section showing properly placed pin penetrating thick area of the pelvis; the result of applying medial pressure to the trochanter while inserting the pin and of the leg being in slight adduction when the pin was inserted.

To prevent wire migration, it is recommended that only threaded wires be used. To prevent breakage, wires of the following diameters are recommended: for dogs up to 10 lb., 0.045 inch; 10 to 25 lb., 0.062 inch; 25 to 60 lb., 0.078 inch; and over 60 lb., 0.125 inch.\*

Six weeks after the luxations had been repaired, necropsies were conducted on each of the 10 dogs. The joint capsules were completely healed in all of the animals and in 4 of the 10 there was reunion of the round ligaments. The articular surfaces appeared normal and were firmly held in proper apposition.

**Fracture Dislocations.**—In 3 dogs weighing between 20 and 25 lb., dislocations were created as previously described and made more difficult to repair by removing, with a chisel, an approximately 2-mm. wide portion of the rim of the acetabulum. This was done to simulate dislocations complicated by fractures of the acetabular rim. Using the dorsal surgical approach,<sup>8</sup> each was repaired by inserting wires over the trochanter and head of the femur into the roof of the acetabulum just ventral to the simulated fracture. After the wires were inserted, the bone fragments were replaced dorsal to the wires and under the deep gluteal muscle as near to their normal positions as possible. The severed gluteal muscles were sutured in place, the skin incision closed, and figure-8 bandages were applied as before. The 3 dogs were closely confined in separate cages for 14 days following surgery and then were placed together in an outside pen. The wires were removed 14 days after surgery and the figure-8 bandages four days later.

Prior to euthanasia, 60 days after surgery, each dog was using its injured leg with only a slight limp. At necropsy, each femur was held firmly in place by the joint capsule and musculature but none of the round ligaments had reunited. The defects created in the acetabular roofs had been bridged by bone and connective tissue. The value of replacing the bone fragments could not be determined since it was impossible to tell whether they had healed in place. It is probable that, had the bone fragments not been replaced, the acetabular defects would have been bridged by bone and connective tissue, provided the Kirschner wires prevented relaxation.

\*Threaded Kirschner wires of the recommended diameters are distributed by Richards Mfg. Co., Memphis, Tenn.

#### CLINICAL CASES

Seven dogs with hip dislocations which had not responded to conservative treatment have been successfully operated on, using the described technique, 4 by the author and 3 by other veterinarians. In each case, the luxated hip had been replaced and a figure-8 bandage applied at least once prior to surgery.

#### DISCUSSION AND CONCLUSIONS

The described Kirschner wire-fixation operation is never indicated in ventral, posterior, or congenital dislocations nor in dislocations of some duration where the acetabulum is filled with connective tissue. In recent dislocations where soft tissue has been interposed between the head of the femur and the acetabulum, a modification of this technique can be used but the operation is more complicated.

This operation is indicated in the early treatment of anterodorsal hip dislocations, where the femoral head can be properly seated in the acetabulum but reduction can not be maintained with a figure-8 bandage, and in dislocations complicated by fractures of the acetabular rim.

It requires no special equipment and little time or experience. Because of the limited number of experimental and clinical cases on which it has been used, the operation can not be properly evaluated at this time.

#### References

- <sup>1</sup>Olsen, M. L.: Canine Surgery. 3rd ed. American Veterinary Publications, Inc., Evanston, Ill., 1952.
- <sup>2</sup>Garbutt, R. J.: Animal Bone Surgery—Dislocations of the Hip. J.A.V.M.A., 113, (1948): 144-150.
- <sup>3</sup>Stader, Otto: Dislocations of the Hip. North Am. Vet., 36, (1955): 1026-1028.
- <sup>4</sup>Devita, Joseph: A Method of Pinning for Chronic Dislocation of the Hip Joint. Proc. Book, AVMA (1952): 191-192.
- <sup>5</sup>Knowles, A. T., Knowles, O., and Knowles, R. P.: An Operation to Preserve the Continuity of the Hip Joint. J.A.V.M.A., 123, (1953): 508-515.
- <sup>6</sup>Dieterle, John: The Use of Kirschner Wires in Maintaining Reduction of Fracture Dislocations of the Ankle Joint. J. Bone and Joint Surg., 17, (1935): 990-995.
- <sup>7</sup>Rowe, M. John, and Sutherland, Ross: Fracture Fixation by Transarticular Pinning. Am. J. Surg., 74, (1947): 24-26.
- <sup>8</sup>Gallagher, J. T. F.: Transarticular Pin Fixation in Fracture Dislocations of the Ankle. Am. J. Surg., 79, (1950): 573-575.
- <sup>9</sup>Brown, R. E.: A Surgical Approach to the Coxofemoral Joint of Dogs. North Am. Vet., 34, (1953): 420-422.



## Embryonal Nephroma (Nephroblastoma) in a Dog

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EMBRYONAL NEPHROMA (nephroblastoma)<sup>1</sup> is a distinctive tumor of the kidney derived from vestiges of undifferentiated renal blastema (metanephrogenic blastema).<sup>1, 2</sup> This neoplasm occurs occasionally in children, swine, chickens, and rabbits; a few cases have also been reported in cattle and dogs.<sup>3-5</sup> When observed at necropsy, the tumor appears fleshy, gray, and lobulated and usually has attained considerable size.

A majority of these tumors seen in animals have been unilateral and did not produce clinical effects. This apparent benignity can be attributed to the fact that the neoplasm occurs most commonly in animals (swine, chickens, and rabbits) that are slaughtered when relatively young. Bilateral involvement of the kidneys and metastasis are both more likely to be found where development of the tumor is not interrupted by early death of the host. Histologically, the tumor is mixed in character and consists essentially of tubules of high cylindrical or cuboidal epithelial cells surrounded by broad zones of indifferent (embryonal) spindle and polyhedral cells.<sup>6</sup> Smooth or striated muscle cells may be present. It is believed that the mixed character of the growth is due to the fact that it originates in renal blastema which develops from the mesoderm.

### CASE REPORT

On June 24, 1955, a 12-lb., male Smooth Fox Terrier, 6 months old, was referred to the Small Animal Clinic at Alabama Polytechnic Institute, Auburn, by a practicing veterinarian.\* The dog had shown bloody urine all its life and developed a pronounced abdominal enlargement during the last two months. A kidney tumor was suspected.

Physical examination revealed a large, circumscribed, nonpainful mass which,

upon palpation, seemed to involve most of the abdomen (fig. 1). The urine was a dull red, indicative of a mild urinary hemorrhage. The animal was essentially normal otherwise, except for a slight anemia and elevated sedimentation rate. Urinalysis showed some red blood cells in the sediment and a 2-plus albumin reaction; however, the blood urea nitrogen was within normal limits. Since a unilateral kidney tumor was suspected, normal and contrast radiographic studies were made. The contrast pyelogram with the use of neo-iopax<sup>†</sup> (10 cc. of 50% solution) demonstrated a retention of the medium in the left kidney while the right kidney remained clear (fig. 2, 3).

A nephrectomy was performed through a left ventral paramedian abdominal incision

<sup>†</sup>Trademark, Schering Corporation, Bloomfield, N.J.



Fig. 1—Dorsal view of the dog showing the enlargement of the abdomen at x.

From the Department of Pathology and Parasitology (Seibold) and Department of Small Animal Medicine and Surgery (Hoerlein), School of Veterinary Medicine, Alabama Polytechnic Institute, Auburn. Dr. Seibold is now at the Plum Island Animal Disease Laboratory, Greenport, Long Island, N.Y.

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\*The authors are indebted to Dr. Martin C. Helouin of Baton Rouge, La., for referring this case to them.

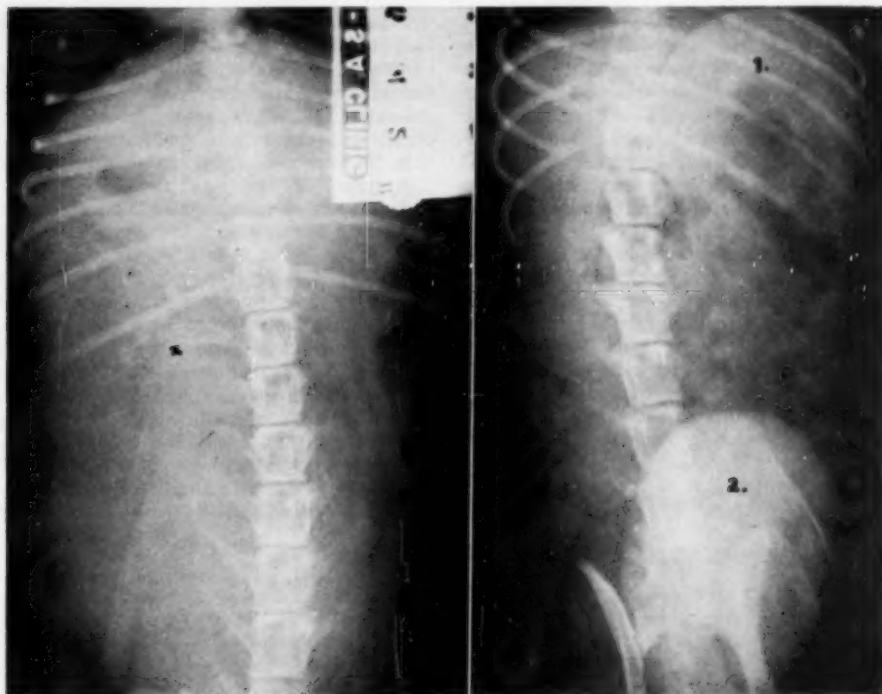


Fig. 2 (Left)—A normal contrast radiograph demonstrating the mass (x) in the left side of the abdomen of the dog.

Fig. 3 (Right)—A ventrodorsal view contrast radiograph (neo-iopax) showing retention of the medium in the tumorous kidney (1); the normal kidney has cleared the medium into the bladder (2).

extending from the xiphoid cartilage to the pubis. Because of its size, the tumorous kidney was retracted from the incision with some difficulty. No evidence of inflammation was observed in the abdominal viscera, although it was difficult to see how normal digestive functions could be maintained under such "crowded conditions." No evidence of metastasis was seen in any abdominal organ. The vascular ligations and closure were routinely performed.

The dog weighed about 6 kg. (12 lb.) prior to surgery, and the tumor mass weighed 427 Gm., approximately 8 per cent of the body weight. Penicillin-streptomycin injections were given for five postoperative days and recovery was uneventful. The animal was discharged eight days after surgery, and on Aug. 15, 1956, the owner reported that it was entirely normal.

#### **PATHOLOGICAL FINDINGS**

The tumor measured approximately 8 by 8 by 14 cm. (fig. 4). No renal tissue could

be identified grossly around the tumor, but atrophic renal elements (glomeruli and tubules) were seen in the thick capsule on subsequent histological examination. Thus, the tumor had almost completely replaced the affected kidney. On cross section, the



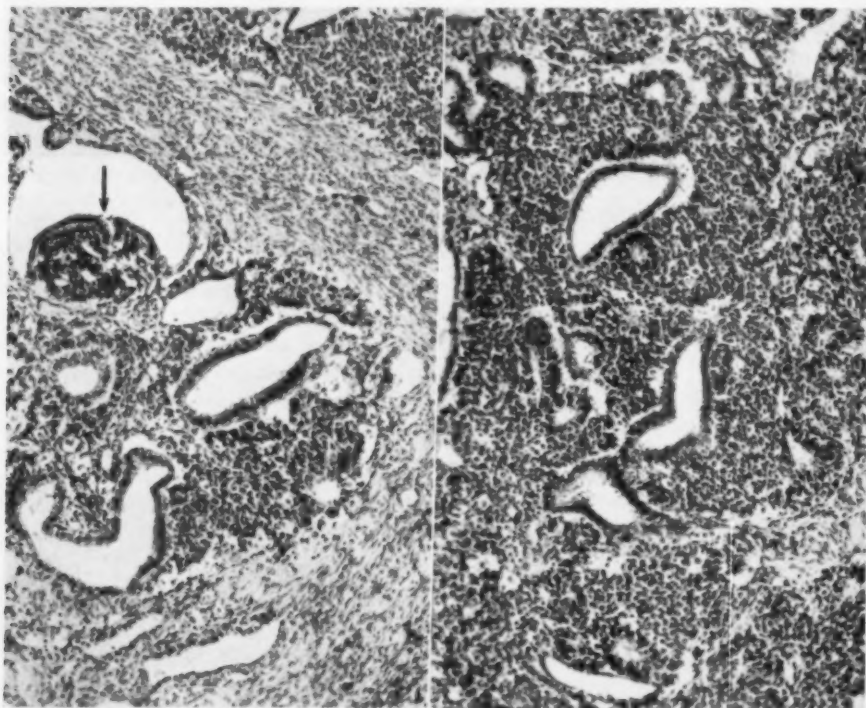
Fig. 4—The gross neoplasm in the dog removed by surgery.

neoplasm was gray, fleshy, and lobulated. No necrotic areas were seen grossly.

The histological pattern of the tumor consisted of irregular areas of a highly cellular, embryonal-type tissue separated by a network of a less cellular and more mature-type tissue (fig. 5). The embryonal tissue was composed of irregular tubules of cuboidal or columnar epithelial cells embedded in a mass of polyhedral and spindle-shaped undifferentiated cells (fig. 6). Some of the tubules were well developed and were demarcated from the background of undifferentiated cells by a distinct basement membrane. Many were less well developed and their lining cells merged with the background of undifferentiated cells in such a way as to suggest that the tubular epithelium developed from the undifferentiated cells. Papillary projections suggestive of early formation of renal corpuscles were seen in a few tubules (fig. 5).

The intervening network of less cellular and more mature-type tissue (fig. 5) might be regarded as comparable to stroma, although the mixed character of this tissue indicated that it also was part of the neoplastic process. It was composed of a mixture of spindle cells, connective tissue fibers, and epithelial tubules. The cellular elements (fibrocytes and epithelium) were obviously more differentiated in character than the cellular elements in the areas of embryonal tissue. However, the number of fibrocytes in many areas was in excess of what would be expected in a simple, non-neoplastic, fibrous stroma and there was a moderate rate of mitotic activity. The microscopic appearance suggested that the network of more mature-type tissue was, at least in part, a product of differentiation of cellular elements in the embryonal areas.

Scattered about in the more mature tissue were occasional large cells morphologi-



A.F.I.P. Photo, No. 55-20733.

A.F.I.P. Photo, No. 55-20732.

Fig. 5 (Left)—Photomicrograph of tumor in the dog showing an area of embryonal tissue (center) partially surrounded by a band of more differentiated tissue. Note the papillary projection (arrow) suggestive of an early renal corpuscle.  $\times 100$ .

Fig. 6 (Right)—Photomicrograph of embryonal area in tumor of the dog showing development of tubules from undifferentiated cells.  $\times 125$ .

cally characteristic of ganglion cells of the sympathetic nervous system. These elements occurred singly or in small groups. Their presence was not characteristic of an embryonal nephroma but the cells appeared well differentiated, and it is doubtful that they should be considered as part of the neoplastic process. Perhaps they were derived from tissue of the sympathetic nervous system that was trapped in the area during prenatal growth of the tumor. As stated above, there was a moderate rate of mitotic activity in the more mature tissue of the tumor. A high rate of mitotic activity was seen in the areas of embryonal tissue, both in the tubular epithelium and in the intervening undifferentiated cells. After completion of the histological studies and consultation with the Registry of Veterinary Pathology, the tumor was classified as embryonal nephroma in the kidney of a dog.

#### SUMMARY

An embryonal nephroma is described in a male Fox Terrier, 6 months old. The dog had exhibited bloody urine since birth.

The lesion, diagnosed clinically and radiographically as a tumor involving the left kidney, was removed surgically. The tumor was approximately 8 per cent of the dog's body weight.

Histologically, a high rate of mitotic activity was seen in areas of embryonal tubular epithelium and intervening undifferentiated cells. Although this tumor appeared potentially malignant, it apparently had not metastasized, since the animal has lived a normal life for 14 months, post-surgery.

#### References

- <sup>1</sup>Bloom, Frank: Pathology of the Dog and Cat. American Veterinary Publications, Inc., Evanston, Ill., 1954.
- <sup>2</sup>Moore, Robert Allen: A Textbook of Pathology. 2nd ed. W. B. Saunders Co., Philadelphia, 1951.
- <sup>3</sup>Jones, T. Lloyd: Embryonal Nephroma in a Dog. *Canad. J. Comp. Med.*, 16, (1952): 153-154.
- <sup>4</sup>Savage, A., and Isa, J. M.: Embryonal Nephroma with Metastasis in a Dog. *J.A.V.M.A.*, 124, (1954): 185-186.
- <sup>5</sup>Cotchin, E.: Further Observations on Neoplasms in Dogs, with Particular Reference to Site of Origin and Malignancy. *Brit. Vet. J.*, 110, (1954): 274-286.
- <sup>6</sup>Ewing, James: Neoplastic Diseases. 4th ed. W. B. Saunders Co., Philadelphia, 1941.

**Estrus in Pregnant Ewes.**—Many western ewes were observed, at the University of Illinois, to mate one or more times dur-

ing early pregnancy (their normal breeding season). The intervals between mating were four to 113 days (av. 21.3 days). Several were slaughtered a few days after mating, only to be found pregnant; none had ovulated. Pregnant Rambouillet ewes (15 of 24) mated during the late stages of pregnancy, 4 of them four to six days before lambing. When the young of 24 ewes were removed a few days after they lambed in October, all showed estrus in less than 61 days.—*J. Anim. Sci.*, Nov., 1956.

#### Fertility at Stages of Estrus

Cows were carefully watched for the time of onset and termination of estrus. The mean duration was 17.1 hours and the period from the end of estrus to ovulation was 11.1 hours. Each cow was inseminated at the onset of estrus and again 12 and 24 hours later, using semen from a bull of a different breed each time. The order of the breeds was rotated.

Twenty-one cows calved from the first, 16 from the second, and 13 from the third insemination. Aberdeen Angus bulls sired 19, Guernseys 16, and Holstein-Friesians 15 of the 50 calves. Calves resulted from inseminations 34 hours before to 14 hours after ovulation. The time of insemination seemed to have no effect on sex and was not an important factor in conception.—*J. Anim. Sci.*, Nov., 1956.

**Induced Estrus in Sows.**—When lactating sows were observed for estrus, all of 7 showed signs at an average of 2.57 days postpartum, and all of 10 showed signs between postpartum days 8 and 56. When given a single dose (1,120 to 3,400 I.U.) of equine gonadotrophin, 76 per cent of the sows injected between days 20 to 39, and 86 per cent of these injected between days 40 and 50, developed estrus in an average of 4.81 days. When bred, pregnancy resulted in 44 per cent of the former group and in 66 per cent of the latter group.—*J. Anim. Sci.*, Nov., 1956.

Human parthenogenesis was investigated in 19 claimants to virgin birth in Britain. One case seemed possible, the mother and daughter showing complete identity of make-up. It was concluded that it could occur but not more frequently than the birth of sextuples, or once in 6.5 billion births.—*J.A.M.A.*, Sept. 29, 1956.

# Clinical Data

## Studies on Bluetongue. V. Distribution of Bluetongue in the United States as Confirmed by Diagnostic Tests

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WITH CONFIRMATION of the presence of bluetongue in California in 1953,<sup>1</sup> it became apparent, in view of the reports from Texas,<sup>2</sup> that the disease was not confined to this state. Since the disease was in the country, the determination of its distribution presented a problem in diagnosis.

In the Union of South Africa where bluetongue has existed for many years and is usually severe, it can generally be diagnosed accurately on a clinical basis. In the United States, apart from its being an entirely new disease, preliminary studies indicate that bluetongue is more mild than the form encountered in South Africa. Therefore, until its clinical manifestations become better known, diagnoses made on a clinical basis are exceedingly unreliable.

To determine the true extent of the disease and to obtain other epizootiological data, it was necessary to confirm the clinical diagnoses and to attempt to establish a reliable diagnosis in states where the condition was suspected to exist. With its presence established within any particular area, future recognition of the disease on a clinical basis would be materially aided. Field specimens were solicited in an effort to confirm the diagnosis of bluetongue in at least one instance in each state where the disease had either been suspected or diagnosed clinically.

### THE IMMUNITY TEST IN SHEEP FOR BLUETONGUE

Little progress had been made in applying serological procedures to the diagnosis of bluetongue at the time of this undertaking. On the recommendation of Dr. R. A. Alexander, director of veterinary serv-

ices for the Union of South Africa, a method<sup>3</sup> used there for immunological studies on strains of the bluetongue virus was adopted, with minor modifications, for confirmatory diagnostic purposes in the United States.

In this procedure, presumably unexposed sheep were inoculated with materials from sheep suspected of having bluetongue rather than with known bluetongue virus. The clinical and thermal responses that developed were recorded and, after an appropriate interval, the immunity of the inoculated sheep was challenged with known virulent bluetongue virus. Thus, the field diagnosis was based to some extent on the response to the initial inoculation but mainly on the reaction to challenge.

In employing this method of diagnosis, certain features of bluetongue, first recognized by the South African investigators, must be kept in mind if the test is to be correctly applied and interpreted. In both naturally occurring and experimentally produced bluetongue, the virus is present in highest concentration in the blood and spleen during the early febrile stages of the disease. By the time the infection is manifested clinically, the virus is in low concentration, particularly in the blood, and is apparently neutralized to a large extent by antibodies. While blood from early febrile cases of bluetongue regularly produces the disease in susceptible sheep, blood—and less often spleen—from animals in the clinical stages of the infection frequently produces nothing more than a mild, transitory fever. Although incapable of causing a clinical infection, the virus apparently multiplies in these animals, since blood drawn from them at the proper time regularly produces the typical experimental disease when subinoculated into susceptible sheep. The antibody is apparently diluted by subpassage to the point where it no longer inhibits the virus.

In contrast with the naturally occurring disease, bluetongue infections produced by injection of the American strains of virus

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The authors thank Dr. R. A. Alexander, director of veterinary service for the Union of South Africa, for his recommendations and advice in connection with the studies reported herein. They also thank Dr. W. O. Neitz and Dr. D. A. Haig, Onderstepoort, Union of South Africa, for reviewing the sections of this paper which refer to studies and observations on bluetongue made at Onderstepoort.



are frequently so mild that they can be recognized only by the sharp febrile response, which usually begins five to eight days after inoculation. Occasionally, swelling of the lips and ears, accompanied by a mild pododermatitis, is observed but not consistently enough to be relied upon exclusively as a diagnostic criterion. Most strains isolated from naturally occurring cases of bluetongue in South Africa produce a marked clinical infection and, occasionally, death on inoculation into susceptible sheep.

In conducting diagnostic confirmatory tests by the procedure described, the nature of the immunity associated with bluetongue must be recognized if the results of the tests are to be interpreted correctly. It was found,<sup>3</sup> on the basis of reciprocal cross-protection tests in sheep in which ten strains of the virus were studied, that each strain is capable of stimulating a degree of basic immunity that is common to all strains. There are, in addition, variable degrees of sharing of additional antigenic components by heterologous strains of the virus. However, these relationships are not fully reciprocal. Strain A, for example, might afford complete protection against strain B, yet only partial protection might be conferred by strain B against strain A virus. Only in the case of homologous challenge is the protection complete. To determine the antigenic relationships of an unknown strain of bluetongue virus to one or more other strains, reciprocal cross-protection tests in sheep must be made. Adequate numbers of test animals must be used if antigenic differences between closely related strains are to be detected.

#### TEST PROCEDURE

*Experimental Sheep.*—Lambs born after the preceding bluetongue season were used as test animals when 6 to 10 months old. They were considered to be uniformly susceptible since they could not have developed any active immunity after birth, and any earlier passive immunity presumably would have disappeared. As an added precaution, 10 to 20 per cent of each shipment of lambs was injected with virulent bluetongue virus. If any failed to react, the whole group was rejected.

*Inoculum.*—Since bluetongue virus can be demonstrated in sheep more readily during the early nonclinical stages of the disease, blood for confirmatory studies was obtained from febrile animals in flocks containing clinical cases of suspected bluetongue. This would eliminate the need for subpassage inoculations, would reduce the number

of sheep needed, and would confirm the infection in minimum time.

Specimens received consisted of clotted and defibrinated blood, blood serum, and occasionally spleens. When spleen was used for inoculation, a portion of the pulp was ground in a cold Waring blender with a small amount of either broth or buffered saline. The mixture was then diluted in the same medium to make a 20 per cent suspension. The supernatant fluid obtained by light centrifugation was used as inoculum. Clotted blood was also ground in a Waring blender but without adding a diluent. At least 2 sheep were injected intravenously with 5 to 10 ml. of each inoculum.

Since bluetongue virus is quite stable, specimens were accumulated until a considerable number were in storage. These were then used at one time, and the inoculated sheep were housed in either the same or adjoining pens, some of which were not insect-proof. Two or more sheep were added to each test group for the duration of the test. These served as temperature controls and, later, as virus-control animals when the inoculated sheep were challenged. Temperatures of all animals were recorded twice daily, usually for 15 consecutive days following inoculation. The mouth of each inoculated animal was examined daily, after the fifth day, until the temperature recordings were discontinued. The feet were also examined for pododermatitis but the pigment in the hoofs of most of the sheep masked this feature if it was present.

If the animals showed no febrile response, blood was collected in OCG\* preservative solution seven to ten days after injection. A portion of the sample was subinoculated into 2 additional sheep which were then examined as described above. If these animals failed to react, their blood was sometimes subinoculated into additional sheep.

Challenge injections, using blood from sheep infected with the California strain 8 virus (identified as bluetongue virus by studies conducted in 1953 at Onderstepoort),<sup>1</sup> were made not earlier than three weeks after the initial inoculation. The challenge blood virus was stored at 4 C. in an equal volume of OCG solution. Each animal was given 2.0 ml. subcutaneously, temperatures were again recorded, and examinations were made as previously described.

*Interpretations of Reactions.*—The results of inoculations with field-specimen materials and subsequently with the challenge virus were interpreted as follows.

A provisional diagnosis of bluetongue was made if the sheep developed a characteristic thermal response four to 12 days following the first inoculation, irrespective of the presence of clinical signs of bluetongue. Failure of such animals to react following challenge constituted a confirmed

\*An anticoagulant preservative solution consisting of 5 Gm. of potassium oxalate, 5 Gm. of phenol, 500 ml. of distilled water, and 500 ml. of glycerin.

diagnosis of bluetongue. A provisionally negative diagnosis was made when sheep failed to respond to inoculation with field materials. However, this was changed to a provisionally positive diagnosis if sheep subinoculated with blood from these animals developed a typical thermal response.

The provisional diagnosis was confirmed if the latter animals proved refractory to challenge. When sheep failed to react to either the original or to the subinoculations, but responded to the challenge virus, the clinical diagnosis of bluetongue was considered to have been incorrect.

### RESULTS

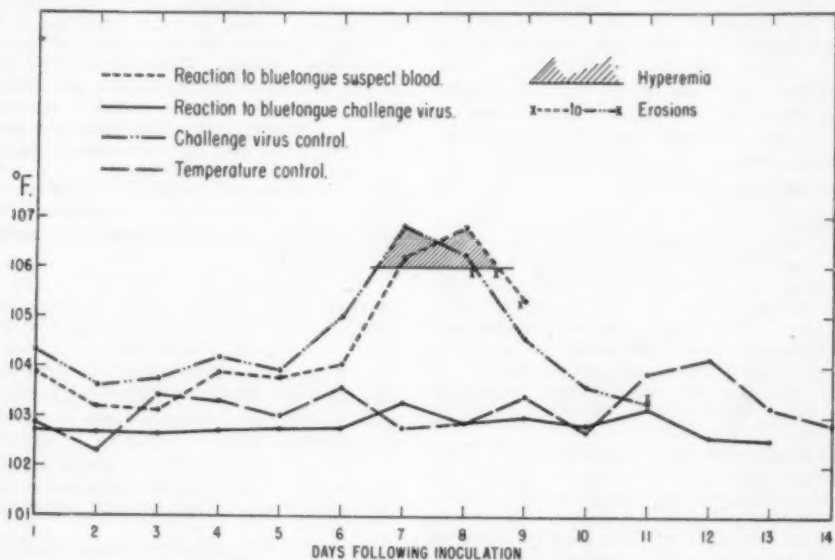
The clinical diagnosis of bluetongue in sheep in Arizona, Colorado, Kansas, Missouri, Nebraska, New Mexico, Oklahoma, and Texas was confirmed by means of the immunity test described. In five instances, subinoculations had to be made in order to demonstrate the presence of virus in the original specimen. Cross challenge gave no indication that any of the strains isolated during this survey differed immunologically from the challenge strain of virus used. Reciprocal cross-protection tests were carried out only in the case of certain of the strains isolated.<sup>4</sup> The characteristic reaction for a confirmed test is shown (graph 1).

Attempts to confirm the diagnosis of bluetongue in Idaho, Indiana, and Wyoming were unsuccessful despite one and sometimes two subpassage inoculations.

### DISCUSSION

On the basis of the immunological method described, the clinical diagnosis of bluetongue was confirmed in eight of the 11 states, exclusive of California, which submitted specimens. Clinical diagnoses were made in one additional state (Utah) which did not furnish materials for diagnostic confirmation. Although the immunity test is inclined to err on the conservative side, whereas the reverse is usually the case for the clinical diagnosis, the correlation between the two was close.

Not all the confirmatory studies were carried out in insect-proof quarters, nor were the groups that received the different specimens isolated from each other. However, there was no evidence to indicate that natural infection, or cross infection between the different groups, occurred while the animals were on experiment. Comparable studies without insect-proof housing have been successfully conducted at Onderstepoort for many years. Inasmuch as *Culicoides*, the alleged vector of the bluetongue virus, is rarely, if ever, found in buildings, the Onderstepoort investigators



Graph 1—A typical confirmed reaction for bluetongue.

believe that the essential precaution in preventing natural bluetongue infection in sheep is to house the animals.

The reason that the immunity test for bluetongue is likely to give a false negative reaction is the present lack of a reliable method of predetermining the susceptibility of sheep used for confirmatory diagnostic studies. Despite efforts to obtain susceptible animals, it is possible that, in some cases, the failure to confirm the field diagnoses was due to the inadvertent use of bluetongue-immune sheep in the test procedure. Recent studies<sup>5,6</sup> at Onderstepoort have resulted in the development of *in vitro* methods for detecting bluetongue antibodies in sheep serum which, on the basis of limited testing, appear to be highly reliable. It is, therefore, possible that in the near future these tests can be used to select satisfactory test animals for studies on bluetongue that must be conducted in the natural host species. Insofar as confirmatory diagnostic procedures are concerned, present indications are that serological methods will entirely replace the use of sheep for this purpose.

#### SUMMARY

The immunity tests in sheep have confirmed the presence of bluetongue in nine states: Arizona, California, Colorado, Kansas, Missouri, Nebraska, New Mexico, Oklahoma, and Texas. Clinical diagnosis indicates a somewhat wider distribution of the disease.

The immunity test, as a confirmatory diagnostic procedure for bluetongue, is limited by the difficulty of identifying susceptible test sheep.

Recent developments indicate that the serodiagnosis of bluetongue may soon be possible.

#### References

- <sup>1</sup>McKercher, D. G., McGowan, Blaine, Howarth, J. A., and Saito, Joseph K.: A Preliminary Report on the Isolation and Identification of the Bluetongue Virus from Sheep in California. J.A.V.M.A., 122, (1953): 300-301.
- <sup>2</sup>Hardy, W. T., and Price, D. A.: Soremuzzle of Sheep. J.A.V.M.A., 120, (1952): 23-25.
- <sup>3</sup>Neitz, W. O.: Immunological Studies on Bluetongue in Sheep. Onderstepoort J. Vet. Sci. and Anim. Indust., 23, (1948): 93-136.
- <sup>4</sup>McKercher, D. G., McGowan, Blaine, Jr., and Saito, Joseph K.: Studies on Bluetongue. I. Isolation, Identification, and Typing of the Bluetongue Virus and a Preliminary Report on the Serodiagnosis of the Disease. Proc. Book, AVMA (1954): 167-177.
- <sup>5</sup>Haig, D. A., McKercher, D. G., and Alexander, R. A.: The Cytopathogenic Activity of Bluetongue Virus on Tissue Cultures and Its Application to the Detection of Antibodies in the Serum of Sheep. Onderstepoort J. Vet. Res. (in press).
- <sup>6</sup>Shone, D. K., Haig, D. A., and McKercher, D. G.: A Complement-Fixation Test for Studies on Bluetongue in Sheep. Onderstepoort J. Vet. Res. (in press).

### Chlorinated Naphthalene Poisoning in Germany

Over 5,000 cases of a disease of cattle appeared in East Germany in the winter of 1954-1955, with a high mortality. The animals showed a severe gastroenteritis, somewhat resembling rinderpest, but without a fever. It was found to be caused by a stomatitis virus infection of animals poisoned by a highly chlorinated naphthalene compound on twine. The twine had been dressed with a wax mixture, including 5 per cent of a chlorinated naphthalene compound commonly used as insulation on electric wires.

Hyperkeratosis did not develop in all of the natural and experimental cases. The virus was readily transmissible but, when uncomplicated, it produced only a mild disease with lacrimation, salivation, and papular lesions of the oral mucosa, which was of little economic importance.—*Vet. Bull., Nov., 1956.*

#### Foot-and-Mouth Disease in Britain.—

During the six months following May 1, 1956, there were 15 primary outbreaks of foot-and-mouth disease in Great Britain. The total epizootic involved the slaughter of 7,775 cattle, 11,587 sheep, 3,336 pigs, and 37 goats. In 12 of the 15 outbreaks, infection was attributed to imported frozen or chilled meat.—*Vet. Rec., Nov. 10, 1956.*

#### Bovine Ocular Carcinomas.—

Records on the 630 Hereford cattle sold (any with eye lesions were sold as soon as convenient) from the New Mexico State College herd, in 21 years, show no eye lesions in animals under 4 years of age, then a gradual increase in affected animals from 0.6 per cent at 4 years of age to 7.9 per cent at 8 years of age. All but 8 were sold when 11 years old or younger; 4 of the last 8 developed a cancer before 14 years of age when all were sold.—*J. Anim. Sci., Nov., 1956.*

## Differentiating Postvaccination Reactions in Brucellosis from Virulent Infection

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THIS PAPER is a report on investigations designed to confirm the suggestion that the whey test could be used to differentiate the postvaccination reaction from that caused by virulent infection. The suggestive evidence was based on data acquired in following whey and blood titers after adult vaccination in a small dairy herd, and a comparative whey and blood test on a large herd.<sup>1</sup> The results in the small herd indicated that titers receded much more rapidly in the whey than in the blood. The comparative test in the herd of over 400 milking cows, in which adult vaccination had been practiced for years, showed 15 per cent blood compared to 4 per cent whey reactors.

Because of the rapid turnover of dairy cattle in certain areas, adult vaccination had been unofficially practiced for many years. The practice resulted in a high incidence of blood reactors which, in view of a recent regulation, could be moved only for slaughter, unless they showed evidence of official vaccination. As a temporary measure to alleviate this hardship, official adult vaccination was permitted in animals that were negative to the blood test ten days prior to vaccination. As a result, there became available for study a number of animals officially adult vaccinated after a negative blood test. Two types of data were obtained: (1) the results of periodic testing of officially adult vaccinated animals; and (2) comparative tests on known adult vaccinated animals in herds from an area where adult vaccination was widely practiced.

### METHODS

Blood and milk samples were obtained concurrently from cooperating herds and tested as previously described,<sup>1</sup> except that the plate test was used instead of the tube technique for the blood, and in the whey test the 0.08-ml. amount was omitted. Usually the blood and milk samples were obtained simultaneously, but never more than 24 hours apart. Testing was conducted in a mobile

laboratory stationed in the area. The interpretation of blood tests was based on the recommendations of the United States Livestock Sanitary Association.<sup>2</sup> Whey titers were designated 2, 3, or 4, representing 0.04, 0.02, and 0.01 ml. of whey, respectively. Titers of 3 or 4 were considered positive, and 2 as suspicious. Official adult vaccination data were obtained from the Division of Animal Industry records or from the owner. Unofficial adult vaccination histories were available only from the owner. Since in the area it was common practice to adult vaccinate all adult herd additions, the information was considered reliable, although exact dates could not be furnished.

### RESULTS

An analysis of the various combinations of blood and whey reactions in 494 adult-vaccinated cows is presented (table 1). Because only 3 whey-suspicious reactions were encountered, they have been included in the whey negatives; two of these were in the blood-positive and one was in the blood-negative group. Thus, there was agreement in 336 of 494, or 68.0 per cent of the samples, while 153 or 30.9 per cent were blood

TABLE 1.—Comparative Brucellosis Blood and Whey Reactions in a Group of Adult-Vaccinated Cows

Reactions		No.	Per cent
Blood	Whey		
—	—	315	63.8
+	+	21	4.2
+	—	69	13.9
s	—	84	17.0
—	+	2	0.4
—	+	3	0.6
Total		494	

positive or suspicious, yet negative to the whey test. From the same herds, 1,903 animals that had been calfhood vaccinated were tested. One hundred and fifty or 8.1 per cent were positive or suspicious on the blood test but were negative to the whey test.

The results of whey tests 30, 60, and 90 days after official adult vaccination of blood- and whey-negative cows in infected herds is summarized (table 2). Blood tests were not made concurrently with all whey tests; they were, however, made at either the 30- or 90-day period. Dry cows at the

<sup>1</sup>From the School of Veterinary Medicine, University of California, Davis.

<sup>2</sup>These investigations are cooperative with the Animal Disease and Parasite Branch, Agricultural Research Service, U.S. Department of Agriculture, Washington, D.C.

TABLE 2—A Summary of Periodic Whey Reactions After Vaccination of Negative Cows with Strain 19 *Brucella Abortus*

No. of reactors	Days after vaccination		
	30	60	90
Whey —	110	190	131
Whey +	78	3	2*
Whey †	45	22	4
Total†	233	217	137
Blood —	2	—	16
Blood +	99	—	67
Blood †	4	—	32
Total†	105	—	115

\*One negative at 120 days. †Variation in numbers due to dry cows.

testing period were responsible for the variation in totals.

#### DISCUSSION

These investigations emphasize a distinct advantage of the whey test over the blood test. It will remove one of the obstacles in an eradication program, namely, the identification of the postvaccination blood titer. The foregoing results provide conclusive evidence that vaccination with strain 19 will cause only a transitory whey titer that will recede to negative within three months. It was earlier demonstrated that a negative whey test can be accepted as evidence that the animal is not infected even if positive or suspicious to the blood test.<sup>1</sup> The conclusion that the whey test will differentiate titers due to virulent infection from postvaccination reactions is supported by the high percentage of whey negatives in animals, vaccinated as adults, which are blood positive or suspicious (table 1). A smaller, but significant, percentage was also observed in animals vaccinated as calves. While this high percentage would be observed only in an area where adult vaccination of negative animals was practiced, it has been recognized that the postvaccination blood reaction in noninfected animals presents a serious problem in eradication programs. These reactions fluctuate to a considerable extent and, frequently, are in the suspicious range. The whey-suspicious titer (0.04 ml.) is found, as a rule, only in infected herds. In testing individuals in herds negative to the brucellosis ring test, it has been observed that the entire herd is invariably negative to the whey test, although blood-suspicious reactors are often present.

Adult vaccination has been practiced in a limited number of areas where conditions made it advisable to do so. Eradication,

using the blood test for diagnosis, would be a hardship in these areas because of the high percentage of noninfected animals that would be slaughtered. In addition to reducing, for the dairyman, the burdensome blood testing in those areas where the procedure becomes a major task, the whey test will permit more frequent testing, considerably reduce the number of suspicious reactions and, in the absence of virulent infection, will not show persistent reactions caused by vaccination with strain 19.

#### CONCLUSION

Because whey reactions will become negative within three months after the vaccination of noninfected animals, the whey test can be effectively used to differentiate the postvaccination reaction from the reaction caused by virulent infection.

#### References

<sup>1</sup>Cameron, H. S., Kendrick, J. W., and Merriam, R. W.: A Whey Plate Test for the Diagnosis of Bovine Brucellosis. J.A.V.M.A., 129, (1956): 19-22.

<sup>2</sup>Report of the Brucellosis Committee, Proc. 58th Ann. Meet., U. S. Livestock San. A. November, 1954.

A *Brucella melitensis* adjuvant vaccine, prepared from a rough culture, produced the same degree of immunity in guinea pigs as a similar vaccine from a typical smooth strain.—*Vet. Rec.*, Nov. 10, 1956.

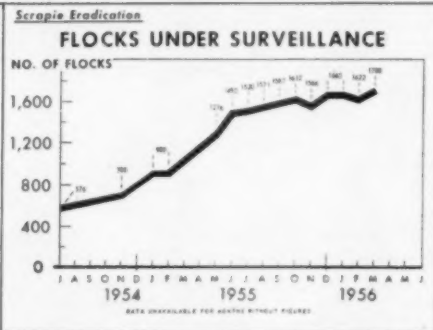
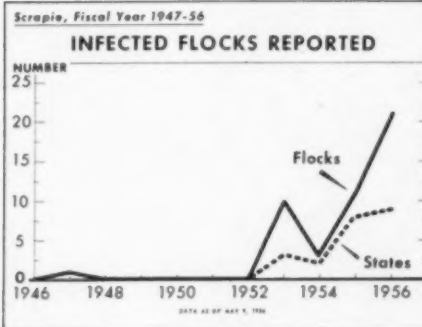
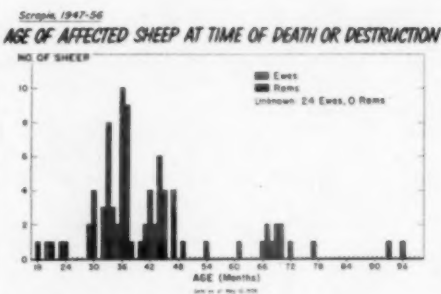
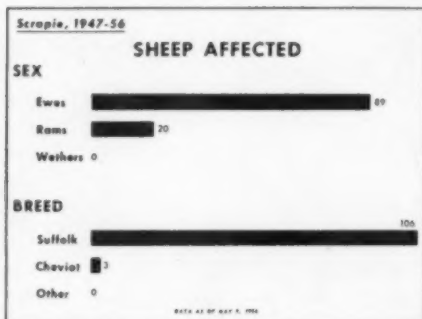
*Mycostatin Controls Fungus*.—When fungi interfered with the cultural examination of milk samples for bacteria, the problem was solved by adding 300 to 400 units of mycostatin per milliliter of milk.—*Vet. Bull.*, Nov., 1956.

*Isoniazid for Johne's Disease*.—Following the oral administration of 1.75 Gm. of isoniazid twice daily for ten days, in France, 10 of 21 cattle with Johne's disease were said to have recovered.—*Vet. Bull.*, Nov., 1956.

*Multiplication of Viruses in Mosquitoes*.—An encephalitis virus multiplied in two species of mosquitoes after infection by feeding or by injection, and in the third species after injection but not after feeding. Three days later, the mosquitoes could transmit the infection for three to 28 days.—*Vet. Bull.*, Sept., 1956.



## Scrapie in the United States



The five figures on this page, prepared by Dr. J. L. Hourigan, chief, Special Diseases Eradication Section of the ARS, U.S.D.A., give a fairly comprehensive report on the distribution and prevalence of scrapie in sheep in the United States. Of special interest are the age when signs of this neurosis appear (mostly 29 to 47 months) and the breeds affected (over 97% Suffolk).

## Visceral Lymphomatosis in a Flock of Turkeys

CHARLES F. SIMPSON, D.V.M., M.Sc.; D. W. ANTHONY, B.S.;  
FRANKLIN YOUNG, M.Ag.

Gainesville, Florida

MEAGER INFORMATION can be found in the literature on the subject of visceral leukosis in turkeys. Fowl leukosis is considered<sup>1</sup> to be a disease peculiar to chickens; naturally occurring cases are rarely reported in other species of fowl. Leukosis has been diagnosed<sup>2</sup> in a parakeet. It was reported<sup>3,4</sup> to be of minor importance as a turkey disease in Illinois. Three additional reports<sup>5-7</sup> note the occurrence of the disease in turkeys.

This paper documents the existence of visceral lymphomatosis in turkeys on a farm in Florida. The gross and microscopic lesions are described and the symptoms and circumstances involved are discussed.

It appears important to recognize the possibility of visceral leukosis occurring in turkeys because well-defined liver lesions may suggest the presence of either enterohepatitis or Hjarre's disease. The lesions in livers of birds having enterohepatitis are depressed, while those of Hjarre's disease have rough or raised edges. Necrosis is a feature of both these diseases, while lymphomatous lesions predominate in leukosis. Tumors in the livers of birds with visceral leukosis are not always elevated above the surface.

### HISTORY OF VISCERAL LEUKOSIS IN A FLOCK OF TURKEYS

A turkey breeder with 280 Broad-Breasted Bronze and 920 Broad White turkeys experienced substantial death losses in breeder hens and toms. Of 1,200 birds, 60 died of the disease. All affected turkeys exhibited identical symptoms and lesions which varied only in degree and extent. Anorexia, progressive and gradual loss of weight, diarrhea, and listlessness were observed.

In all cases, birds having evidence of disease at necropsy were also found to be heavily parasitized with *Leucocytozoon smithi*. Details pertaining to the coexistence of this parasite and leukosis have been described in a separate paper.<sup>8</sup>

### GROSS LESIONS

Tumors were consistently found in the spleen, liver, and kidney. Occasionally,

various other organs were also affected. The spleen was markedly enlarged, its capsule appeared thickened, and the parenchyma contained visible white foci. The liver was enlarged, with multiple elevated areas on its surface which were well defined, white, and firm. The white tumorous areas extended into the interior and frequently involved the liver so extensively that little normal-appearing hepatic tissue remained.

Rupture of the liver capsule, due to neoplastic growths, resulted in an internal hemorrhage and was the immediate cause of death in 1 bird. The kidneys were swollen and contained tumorous growths which were white, firm, and diffuse. The ovaries of hen turkeys were also frequently involved with tumors. In 3 males, a large, firm, white, round-to-oval growth was found intimately attached to the testicle (fig. 1). Infrequently, the myocardium contained white nodules or pale-colored lines. Occasionally, pericarditis had developed. The pancreas, on several occasions, showed evidence of disease; it was markedly swollen and had a distinct, nodular, bulging external appearance (fig. 2). Portions of the intestinal wall were extensively thickened by white homogeneous masses. The wall of the terminal portion of the ileum and cecum had undergone visible annular enlargement so that their lumens were



Fig. 1—A solid lymphoid mass is shown intimately attached to the testicle (left).

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Florida Agricultural Experiment Station journal series, paper No. 507.



Fig. 2—Enlarged, swollen, nodular pancreas shown in the duodenal loop. Cross sections demonstrated that the wall of the duodenum was greatly thickened.

greatly diminished in size and were almost occluded. Grossly, the duodenum appeared normal; however, sections demonstrated that a tumorous growth had caused one

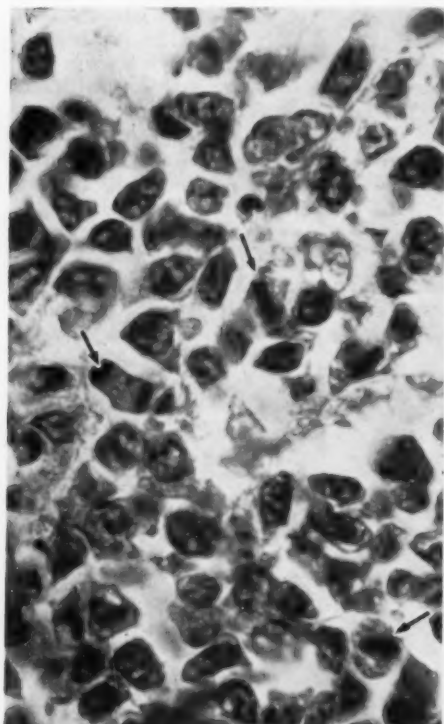


Fig. 3—Photomicrograph showing lymphoblast-like cells in a section from liver. Mitotic cells are seen in three cells (arrow). Hematoxylin and eosin stain;  $\times 1,375$ .

half of the wall to become greatly thickened and had caused the lumen to diminish. Infrequently, small, white nodules occurred in the wall of the proventriculus. Such thickenings of the gastrointestinal tract had a remarkable resemblance to visceral lymphosarcoma as described in cats, dogs, cattle, and other animals. The mucosal surface of the affected portions of the intestinal tract was covered with a necrotic exudate.

#### HISTOPATHOLOGY

The tissues were fixed in 10 per cent neutral formalin, cut at  $6\ \mu$ , and were stained with hematoxylin and eosin. Microscopically, all lesions were found to be composed of dense masses of lymphoid cells which had infiltrated and replaced normal tissue. Predominant was a lymphoblast-like cell which had a scant amount of cytoplasm and a large, prominent, rounded basophilic nucleus with a distinct nucleolus. The chromatin material of the nucleus was primarily peripheral. A number of the cells exhibited mitotic figures (fig. 3), which helped to identify the lesions as neoplasms rather than as inflammatory reactions.

The degree of neoplastic invasion varied; both diffuse and focal accumulations of closely packed lymphoblast-like cells were often seen in the same sections.

Islands and strands of hepatic cells that

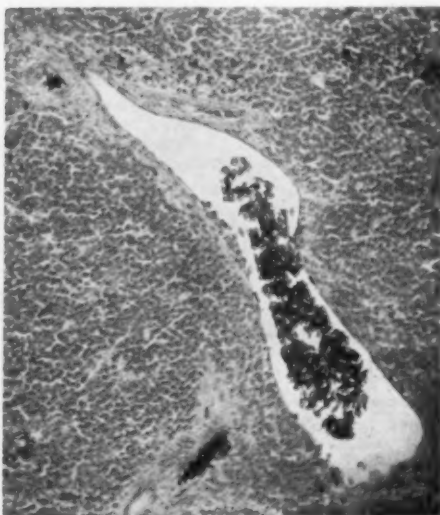


Fig. 4—Foci of lymphoid tissue surrounding and invading a portal vein. Hematoxylin and eosin stain;  $\times 175$ .

had undergone albuminous or fatty degeneration persisted between dense masses of lymphoid cells. Large and small multiple foci and diffuse accumulations of the neoplastic cells extended from the subcapsular region to deep in the parenchyma and had, in many cases, largely replaced the liver tissue. Commonly, they had invaded the adventitia and media of the portal vessels and, frequently, only vague silhouettes of bile ducts remained in affected portal triad areas (fig. 4).

In the kidneys, foci of lymphoblast-like cells had destroyed tubular elements, infiltrated the glomeruli and interstitial tissues, and caused albuminous or hydropic degeneration of the tubular epithelium (fig. 5).

Myocardial fibers were separated and broken by focal and diffuse accumulations of lymphoid cells.

The pancreas was swollen and lobulated by the infiltration of lymphoid cells, primarily interstitial in nature, which caused a considerable separation, degeneration, and destruction of the glandular elements. Islands of Langerhans were rare in sections prepared from such tumor-invaded glands (fig. 6).

The thickened walls of the duodenum, terminal ileum, and cecum were sectioned and examined. All portions of the intestinal

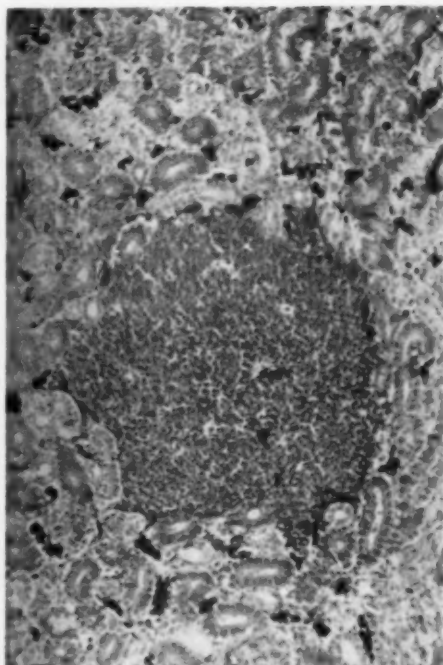
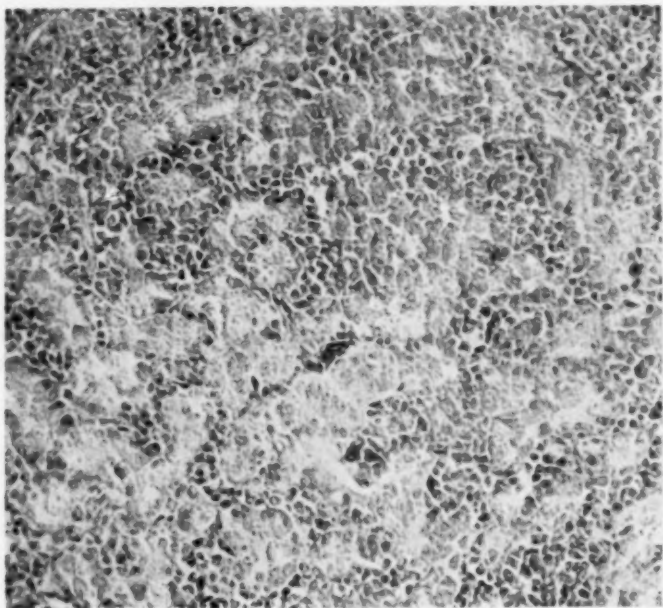


Fig. 5—Focal invasion of liver by lymphoid tissue which has caused destruction of tubular elements and albuminous degeneration of the adjacent tubules. Hematoxylin and eosin stain;  $\times 120$ .

Fig. 6—Pancreas showing diffuse, interstitial infiltration with resulting degeneration and separation of the glandular elements. Hematoxylin and eosin stain;  $\times 310$ .



wall, from the outer muscular layer to the mucosa, were infiltrated with lymphoid tissue. In the duodenum, the most prominent lesion was found in the lamina propria. This layer was greatly thickened and most mucosal glands were either compressed or eliminated. The surface epithelium was ulcerated and the lumen was pronouncedly diminished. The outer muscular tunic was only slightly involved.

The terminal ileum was more intensively infiltrated by lymphoid cells than were other affected portions of the intestinal tract. The entire area from the outer muscular layer, including the mucosa, consisted of a dense mass of lymphoid tissue which contained a few isolated muscular strands. There was ulceration of the surface epithelium and near obliteration of the mucosal glands. The lumen of this portion of the intestinal tract was obviously misshapen and greatly reduced.

Involvement of the cecum was similar to that of the duodenum and terminal ileum, with ulceration of the surface epithelium, partial loss of mucosal glands, and dense infiltration of the mucosa by lymphoid cells. There was also a mild separation and disruption of the muscularis mucosae and occasional involvement of the inner muscular layer.

The lamina propria of the proventriculus was thickened as a result of diffuse and focal lymphoid infiltration, causing some destruction of the superficial glands. The superficial epithelium and deep glands were unaffected.

#### SUMMARY

The gross and microscopic pathology of visceral lymphomatosis in one flock of turkeys is described. Tumors were consistently seen in the spleens, livers, and kidneys of affected birds. Occasionally, neoplastic growths were also observed in, or in close contact with, the reproductive organs. Tumorous involvement of the pancreas, heart, and gastrointestinal tract was also observed in some cases. All lesions were found to be composed of dense masses of lymphoid cells, many of which exhibited mitotic figures. This finding helped to characterize the lesions as neoplastic rather than as inflammatory.

#### References

<sup>1</sup>Biester, H. E., and Schwarte, L. H.: *Diseases of Poultry*, 3rd ed. Iowa State College Press, Ames (1952): 751-752.

<sup>2</sup>Järmai, K.: Leukose und Sarkom beim Wellensittich. *Arch. f. wissensch. prakt. Tierheilk.*, 74, (1939): 316.

<sup>3</sup>Prier, J. E., and Alberts, J. O.: *Turkey Diseases*. Univ. of Illinois Agric. Exten. Circ. 654, (1950): 17-18.

<sup>4</sup>Hanson, L. E.: University of Illinois, personal communication, Feb. 1956.

<sup>5</sup>Pamukcu, A. M., and Baskaya, H.: Leucosis Complex. I. Ankara'da tavuklarda görülen visceral lymphomatosis olaylari. *Vet. Bull.*, 23, (1952): 3432.

<sup>6</sup>Durant, A. J.: Leukemia in Fowls. *Missouri Agric. Exper. Sta. Bull.* 295, 1930.

<sup>7</sup>Pollard M., and Hale, W. J.: Interspecies Transmission of Avian Leucosis in Embryos. *Am. J. Vet. Res.*, 3, (1942): 247-252.

<sup>8</sup>Simpson, C. F., Anthony, D. W., and Young, F.: Parasitism of Adult Turkeys in Florida by *Leucocytozoon smithi* (Laveren and Lucet). *J. A. V. M. A.*, 129, (1956): 573-575.

*White Muscle Disease of Calves.*—In Russia, white muscle disease was related to soil mineral deficiency which caused a shortage of copper, cobalt, magnesium, and iodine in the vegetation and in the milk of cows. The disease was prevented by feeding trace elements to the pregnant and lactating cows and to the young calves.—*Vet. Bull.*, Sept., 1956.

The search for enzymes to remove necrotic tissue from burns or wounds has turned to exotic plants, tuna fish, cattle, and swine. Needed is an enzyme that will act on collagen, a protein which gives toughness to tissue. Enzymes from papaya, tropical fig trees, and pineapple, long used for tenderizing meat, may be useful.—*Sci. News Letter*, Nov. 17, 1956.

*Hog Cholera in Britain.*—During the first nine and a half months of 1956, hog cholera was reported in Britain on 630 occasions, compared with 1,182 in 1955, 1,202 in 1954, and 2,352 in 1953.—*Vet. Rec.*, Nov. 10, 1956.

When alfalfa made up 50 per cent of the ration of pigs, it replaced 0.5 lb. of grain and supplement. Although these pigs had a lower dressing percentage, they had a higher percentage of lean meat than grain-fed pigs.—*J. Anim. Sci.*, Nov., 1956.

*Hereditary Edema in Ayrshire Calf.*—Hereditary edema in an Ayrshire heifer calf, similar to that reported in a bull calf a year ago, was again found associated with a large cyst in the pituitary gland.—*J. Dai. Sci.*, July, 1956.



## What Is Your Diagnosis?

Because of the interest in veterinary radiology, a case history and accompanying radiographs depicting a diagnostic problem are usually published in each issue of the JOURNAL.

**Make your diagnosis from the picture below—then turn the page ►**



Figure 1

*History.*—A male, Terrier type of dog, 4½ years old, a native of Tucson, Ariz., gradually developed a restricted waddling gait. He held his head in a lowered position and showed pain when it was raised and lowered. He had a low-grade fever but had never failed to eat in spite of his difficulty in rising, moving, and reaching down to the feed bowl. The owner had noticed a swelling of the legs but no tenderness when they were palpated; nor had he been aware of a cough. A lateral radiograph was taken.

*(Diagnosis and findings are reported on the next page)*

## Here Is the Diagnosis

(Continued from preceding page)

*Diagnosis.*—Coccidioidomycosis. Multiple granulomatous periostitis, and possibly osteomyelitis, due to the coccidioidal infection.

*Comment.*—This disease, locally called "valley fever," is increasingly more common in dogs in the southwestern desert areas. It affects primarily the respiratory system, and possibly 5 per cent of the affected dogs develop bone lesions.



Fig. 2—Radiograph (lateral view) showing granulomatous bone lesions (arrows) of the cervical vertebrae, both humeri, and an ulna.

This case report was submitted by Dr. Ross M. Carter, Tucson, Ariz.

## Attempted Control of Erysipelas in Turkeys with Furazolidone

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It has been reported<sup>1</sup> that *Erysipelothrix rhusiopathiae* is sensitive to furazolidone *in vitro* but that the experimental disease in chicks was not controlled by oral administration of the drug. A similar experiment with erysipelas in turkeys is, therefore, of interest.

**Materials and Methods.**—Ten groups of 8 female and 2 male Broad Breasted Bronze breeder turkeys were selected at random and were placed in ten small pens. They were fed a commercial turkey breeder mash and whole grains mixed in equal portions. Furazolidone was incorporated into the feed of groups 3, 4, 7, and 8 at the 0.02 per cent level from the start of the experiment. Pens 5 and 6 received identical furazolidone treatment, except that start of feeding was delayed until the day that deaths from erysipelas occurred in these pens. The turkeys in pens 1 through 6 were exposed to erysipelas by adding to each pen 2 breeder males inoculated intravenously with a virulent strain of *Ery. rhusiopathiae*. These inoculated males were allowed to die in the pen and to remain there after death for one week, or until 1 of the exposed birds in the pen died.

Thus, the birds in groups 1 and 2 were untreated, erysipelas-exposed controls; groups 3 and 4 were furazolidone-treated from the time of erysipelas exposure; groups 5 and 6 were furazolidone-treated from the time of death of the added inoculated males; groups 7 and 8 were unexposed, furazolidone-treated controls; and groups 9 and 10 were untreated, unexposed controls.

**Results.**—No deaths occurred in pens not exposed to erysipelas. Deaths due to erysipelas occurred in all exposed groups. All males inoculated with *Ery. rhusiopathiae* died on the second day after inoculation. Four (20%) of the 20 untreated, exposed

birds in pens 1 and 2 died four to eight days after death of the inoculated males. Three (15%) of the 20 furazolidone-treated, exposed birds in pens 3 and 4, also in pens 5 and 6, died two to 19 days after death of the inoculated birds.

Of the 12 males exposed to erysipelas, 50 per cent died regardless of treatment. Of the erysipelas-exposed females, 2 (12.5%) of the 16 untreated controls died, and 2 (6.3%) of the 32 treated with furazolidone died.

**Conclusion.**—Furazolidone at the 0.02 per cent level in the feed had slight, if any, effect on erysipelas of turkeys.

## A Complex Cardiac Anomaly in a Calf

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L. E. EVANS, D.V.M., M.S.

Auburn, Alabama

Various cardiac anomalies have been reported in man and animals.<sup>1-3</sup> This case was found in a normal sized, Aberdeen Angus calf that died three days after birth.

The heart was somewhat enlarged and rounded in contour. The aorta arose from the right ventricle (transposition) (fig. 1, A) and gave off the coronary arteries in the sinuses above the right and left posterior aortic valves. A segment of the aorta, 2 cm. long and extending from the common brachiocephalic trunk to the ductus arteriosus (fig. 1, B), was sharply constricted to a diameter of 0.5 cm. This constriction corresponded to the infantile type of coarctation of the aorta described in man and reported in 1 Holstein-Friesian calf.<sup>3</sup>

The pulmonary artery (fig. 1, C) arose from the left ventricle (transposition) and communicated with the aorta just distal to its coarctation through a patent ductus arteriosus with an 0.8-cm. lumen (fig. 1, D).

There was a defect or opening about 1 inch long in the interventricular septum. The interatrial septum was complete. All of the venous channels leading to the heart opened at their normal locations. The diag-

From the Washington Agricultural Experiment Stations, Puyallup, project #60. Dr. Jerstad is associate veterinarian, Western Washington Experiment Station, Puyallup, and Mr. Johns is bacteriologist, Washington State Department of Agriculture, Puyallup.

This work was supported in part by Hess and Clark, Inc., Ashland, Ohio.

<sup>1</sup>Smith, H. Williams: The Chemotherapy of Experimental Erysipelothrix Rhusiopathiae Infection in Chicks and Turkeys. *J. Comp. Path. and Therap.*, 66, (1956): 151-158.

From the Department of Pathology and Parasitology (Seibold) and Department of Anatomy and Histology (Evans), School of Veterinary Medicine, Alabama Polytechnic Institute, Auburn. Dr. Seibold is now with the Plum Island Animal Disease Laboratory, Greenport, Long Island, N.Y.

This paper was approved by the Committee on Publications, School of Veterinary Medicine, Alabama Polytechnic Institute, Auburn, publication No. 617.

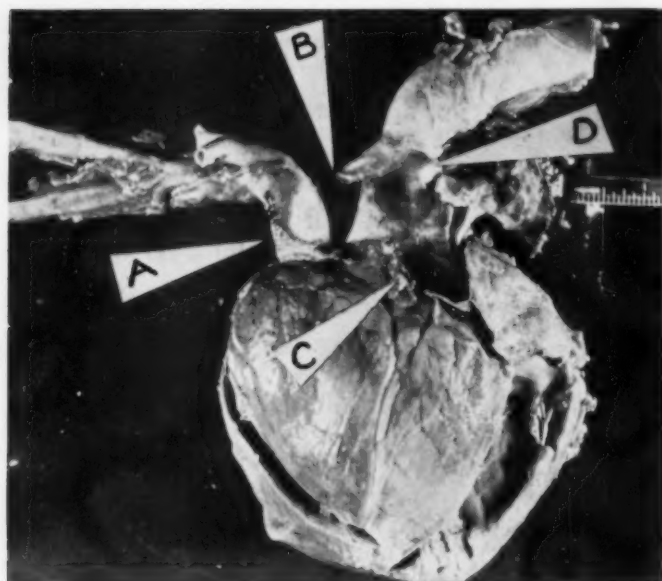


Fig. 1—Photograph of the left latero-anterior view of the heart of a calf showing: (A) origin of aorta from right ventricle; (B) coarctation of the aorta; (C) origin of pulmonary artery from left ventricle; and (D) ductus arteriosus. The end of the rule is resting on the hilus of the lungs.

nosis was (1) transposition of the great vessels, (2) coarctation of the aorta, (3) defect of the interventricular septum, and (4) patent ductus arteriosus.

Judging from the size of the calf, it was apparent that this complex anomaly and resulting abnormalities of blood circulation had no deleterious effect on the development of the animal *in utero*. That is understandable since the oxygenated blood from the placenta blends with venous blood returning to the heart, and the maintenance of a pulmonary blood circuit in series with each systemic blood circuit is not essential to the life of the fetus. Only maintenance of an adequate systemic circulation is necessary. The defect in the interventricular septum, together with the patent ductus arteriosus, provided a shunt to the coarctation of the aorta, resulting in adequate blood circulation to the body of the fetus.

Following birth of the calf, there was an immediate deficiency of oxygenated blood in the brachiocephalic trunk and coronary arteries because the only oxygenated blood coming to these vessels had to pass through the defect in the interventricular septum. Total blood flow reaching the thoracic aorta through the area of coarctation and by way of the shunt through the septum defect and patent ductus probably

was also inadequate for the increased body activity after birth.

#### References

- <sup>1</sup>Bremer, J. L.: Transposition of the Heart and Pulmonary Artery. *Arch. Path.*, 34, (1942): 1016-1030.
- <sup>2</sup>Bullard, J. F.: Anomalous Heart in a Calf. *J.A.V.M.A.*, 87, (1935): 577-579.
- <sup>3</sup>Cordy, D. R., and Ribelin, W. E.: Six Congenital Cardiac Anomalies in Animals. *Cornell Vet.*, 40, (1950): 249-256.
- <sup>4</sup>Harris, J. S., and Farber, S.: Transposition of the Great Cardiac Vessels. *Arch. Path.*, 28, (1939): 427-502.
- <sup>5</sup>Jasper, D. E.: Myocardial Abscesses Associated with a Congenital Cardiac Defect in a Heifer. *Cornell Vet.*, 38, (1948): 436-439.
- <sup>6</sup>Stenius, P. I.: Three Cases of Malformation of the Heart in Calves. *Skand. Vet.-tidsskr.*, 36, (1946): 385 (abstr. in *J.A.V.M.A.*, 110, (1947): 39).
- <sup>7</sup>Vitums, Arturs: A Complete Transposition of the Origins of the Aorta and the Pulmonary Artery in a Calf. *Cornell Vet.*, 46, (1956): 282.
- <sup>8</sup>Olafson, P.: Congenital Cardiac Anomalies in Animals. *J. Tech. Methods*, 19, (1939): 128.

#### ADDENDUM

Since preparation of this note, a case of persistent truncus arteriosus was observed in the heart taken from a mixed breed heifer, 1 year old, slaughtered at an abattoir in Moultrie, Ga.\* A large common arterial trunk was given off the base of the

\*Specimen forwarded by Dr. A. D. Dillard, Moultrie, Ga.

heart above a large defect in the inter-ventricular septum. The orifice of the trunk was guarded by a semilunar valve with three cusps. Behind each of two of these cusps there was an opening of a coronary artery. The conus arteriosus of the right ventricle was blind and there was no evidence of any pulmonary artery arising from the base of the heart. There was a small (0.5 cm.) patent foramen ovale. The common arterial trunk, persistent truncus arteriosus, was cut off so close to the base of the heart that it was not possible to determine where and how division of the common arterial trunk into the aorta and pulmonary artery occurred.

### Experimental Bovine Leptospirosis— An Abstract

A strain of *Leptospira pomona* which had been isolated recently from naturally occurring bovine leptospirosis was used to expose experimental cattle in order to study factors involved in reproductive failure and the pathological changes which occur in infected cattle and aborted fetuses.

A yearling Jersey bull was injected intramuscularly with 5.0 cc. of tissue suspension from a seventh hamster passage of *L. pomona*. The bull was febrile on the third day, with temperatures up to 105.4 F. to the sixth day. Feed was refused after the fifth day. On the seventh day, the bull was unable to rise without assistance, his temperature was subnormal, pulse weak and rapid, and respirations rapid and labored. Incontinence and a definite reddish urine were evident. Death occurred during the seventh day.

No outstanding gross lesions were evident at necropsy, except slight icterus in the liver and brain and petechiae in the subcutaneous tissues and kidneys. The bladder contained about 1 liter of red urine. The blood appeared watery. Histological changes, seen in only the kidney, liver, spleen, and adrenal glands, were characterized principally by various stages of cellular necrosis and areas of hemorrhage.

Eleven cows, 6 Jerseys and 5 Holstein-Friesians, were exposed to the same strain of *L. pomona* and all became infected. Leptospiras were demonstrated in the blood of 10 of the 11 cattle on one or more days during the first week, and the other cow shed leptospiras in the urine at a later time. *Leptospira pomona* became localized in the

kidneys and was shed in the urine of 7 of the 11 cows between days 13 and 102 following infection.

Of the 9 cows exposed at various stages of pregnancy, 3 aborted dead fetuses: a 7-month fetus 19 days after infection; a 5½-month fetus at 20 days; and a 6-month fetus at 47 days. The first 2 fetuses appeared to have been dead only a few hours but the 1 aborted at 47 days must have been dead two weeks or more, since it was dehydrated and undergoing degeneration.

The exact mechanism by which *L. pomona* produces abortion in cattle is not clear. The organism has not been demonstrated in the aborted fetus in a typical case of *L. pomona* infection. An acceptable hypothesis is based on the presence of a toxic substance in the cow, released when the leptospiras are lysed by the antibodies being produced, which in turn passes through the placenta and causes death of the fetus. The sudden reduction in the number of circulating erythrocytes in cattle coinciding with the appearance of circulating antibodies and the paucity of erythrocytes in the aborted fetus are accepted as evidence favoring the hypothesis.

The cows were sent to slaughter four to seven months following infection. Gross lesions of leptospirosis were found only in the kidneys. Histopathological findings were similar in all kidneys studied but they differed in extent. The epithelium in the tubules showed varying degrees of degeneration in both the cortical and medullary portions. Lymphocytic infiltration was common. The glomeruli were in various stages of degeneration. Hemorrhages were found in certain areas. The appearance of deeply basophilic cells on the basement membrane and areas with two layers of tubule cells indicated beginning regeneration. No leptospiras were found in the kidneys either by direct microscopy or by hamster inoculation.—[L. C. Ferguson, J. C. Ramge, and V. L. Sanger: *Experimental Bovine Leptospirosis*. *Am. J. Vet. Res.*, 17, (Jan., 1957): 43-49.]

*Leptospira Icterohaemorrhagiae* in Cattle and Man.—Blood samples from a man and cattle on the same farm in Ohio were recently found positive for *Leptospira icterohaemorrhagiae* and negative for *Leptospira pomona*. This suggests that all samples should be tested for both infections.—*Anim. Dis. Trends*, Oct., 1956.



## Swine Nutrition and Parakeratosis

In early research with parakeratosis at Michigan State University, it was found that good pasture, or feeding soured liquid buttermilk, helped to speed recovery. This can now be explained by the relationship between zinc and calcium. The calcium requirement of growing pigs is about 0.55 per cent of the ration. When corn is mixed with sufficient supplement (35 per cent protein) to provide weanling pigs with the needed 18 per cent protein ration, the resulting calcium content is about 1.2 per cent, which would produce parakeratosis. Omitting the mineral from the supplement and feeding it free choice would avoid the excess of calcium. When pigs were fed a ration containing 1.5 per cent of calcium, all developed severe skin lesions; but when 20 p.p.m. of zinc, in the form of zinc carbonate, was added, only 1 of 10 pigs developed lesions.—*Cornell Nutr. Conf.*, Nov. 8, 1956.

**Effect of Stilbestrol on Glands.**—When bulls and steers, 10 each, were given subcutaneous implants in the ear of 84 mg. of diethylstilbestrol, and this was repeated in 84 days, the carcass quality was lowered in the steers but increased in the bulls as compared with controls. The pituitary glands were slightly heavier and the adrenal glands significantly heavier in all treated cattle, while the thyroid glands were significantly lighter in the bulls but unchanged in the steers.—*J. Anim. Sci.*, Aug., 1956.

## Enterocolitis in Chinchillas Fed Chlortetracycline

Fifty of 450 chinchillas, fed pellets containing 0.2 mg. of chlortetracycline per ounce for 12 to 18 months, died with a characteristic symptom complex. They became lethargic, refused feed and water, developed a diarrhea occasionally streaked with blood, and died quietly within 12 to 36 hours.

Necropsy revealed liquid fecal material but no gross lesions. Multiple areas of focal necrosis and shallow ulcers covered by pseudomembrane were seen microscopically in the large intestine and occasionally in the small intestine. They contained myriads of gram-positive cocci in huge clumps, but no parasites nor fungi, and often no gram-negative bacteria.

All antemortem stool and throat cultures showed profuse growth of hemolytic *Staphylococcus aureus* but no *Shigella* or *Salmonella*.

The condition was corrected by changing to pellets which contained no antibiotics and by giving, for four days, neomycin (50 units/ml.) and bacitracin (25 units/ml.) in the drinking water; neither is appreciably absorbed and both destroy *Staphylococcus*.

A similar condition affects human beings after administration of certain antibiotics in therapeutic doses.—*NCBA Res. Bull.* 27, Sept., 1956.

## Livestock and Feed Estimates

Estimates for the coming year, made in October by the Feed Survey Committee of the American Feed Manufacturers Association, indicate a small decrease in the numbers of hogs and chickens, an increase in broilers and turkeys, and little or no change in laying flocks, dairy cattle, and beef cattle. About 123 of the 152 million tons of concentrated feedstuffs available is expected to be consumed during the year.

Pig crop estimates for the fall of 1956 are 32,260,000 head, a 7 per cent drop; and for the spring of 1957, 52,023,000 head, a 2 per cent drop.

The average number of laying hens may be 325,815,000, an increase of 1 per cent. Commercial broilers may increase 10 per cent to 1,423,308,000 and turkeys may increase 5 per cent to 80,157,000.

Cows to be milked may decrease less than 1 per cent to about 21,000,000; beef cattle will decrease due to the drought in the Southwest and Great Plains regions, but the number on feed will increase because of the abundance of grain.

Sheep numbers will change little but horses and mules will decrease about 6 per cent.

The feed to be used by miscellaneous animals, including fur-bearing animals, goats, rabbits, dogs, and cats, is estimated at nearly 4,000,000 tons.

The 1956 production of four major feed grains was 5 per cent smaller, that of the three major oil seed crops was 18 per cent larger, than in 1955. The supply of grains available exceeds that of 1955 by nearly 30 per cent. The hay crop is the second largest on record but the quality is variable.—*Feed-O-Gram*, Oct. 29, 1956.

## Distribution of Vitamins

In many foods, there is an uneven distribution of vitamins and, in some cases, they are confined largely to one particular tissue. In cereal grain, vitamin B<sub>1</sub> and nicotinic acid are largely confined to two layers of the germ. In leafy vegetables, carotene and vitamin C are usually higher in the leaves, while there is more vitamin C in the interior of root vegetables than in their periphery.

Of animal tissues, liver and kidney are rich in vitamins, while skeletal muscle is relatively poor. However, the muscles of the pig are rich in vitamin B<sub>1</sub>. There may be consistent differences in the concentration of B vitamins between individual muscles of an animal but that in the corresponding muscles of opposites sides is similar. In the chicken and turkey, the dark muscles are richer in vitamin B and riboflavin but poorer in nicotinic acid than the light muscles. In the pig, muscles rich in vitamin B<sub>1</sub> tend to be rich in nicotinic acid and poor in riboflavin and pantothenic acid.

Vitamins A, D, and B<sub>1</sub> are confined almost entirely to the yolk of a hen's egg, while other B vitamins are found in both the yolk and the albumin, with nicotinic acid being higher in the latter.—*Vet. Bull., Nov., 1956.*

## Microphthalmia and Avitaminosis A

Following a severe drought in England, 12 young sows farrowed 84 pigs with microphthalmia, half of which were born dead or died in a few days. Several other sows which had access to green pastures produced normal litters. The sows showed no signs of other disease and had not been vaccinated. The eyes of the blind pigs varied from a small, but normal eye to a smaller disoriented mass. Several pigs were unable to fully extend the carpal joints or showed incoordination of the hindlegs. Some had hyperkeratotic lesions and a few had abnormal genital organs. This condition has been produced by feeding a vitamin A-deficient ration.—*Vet. Rec., Nov. 10, 1956.*

**Carotene Deficiency and Hydrocephalus.**—When 12 normal dairy cows were placed on a low carotene ration during pregnancy, their calves were normal but, when this ration was continued to the third generation, there was a marked loss of reproduc-

tive efficiency with only 2 normal calves produced by the second-generation cows in 28 months.

Of 9 third-generation calves, either still-born or too weak to survive, 5 showed hydrocephalus and all showed more or less degeneration of the optic nerves. In some, there was also damage to the pituitary, adrenal, and sex glands. The recommended carotene allowance for dairy cows is apparently too low.—*J. Dai. Sci., Nov., 1956.*

## Effect of Iodide on Lactation

When potassium iodide (120 mg. daily) was fed to Egyptian buffalo cows at Cairo University for 11 to 33 weeks, those receiving the iodide produced 20 per cent more milk in the same period and some continued to produce milk longer than did the controls. There was a lag in the response, the greatest stimulation being in those fed iodine for at least 20 weeks.

The composition of the milk was affected but the only significant increases were in acidity, specific gravity, and nonfat solids. Milk fat was significantly lowered. The effect on milk composition was similar to that from feeding iodinated casein or thyroid protein. Undesirable side effects, such as occur in thyroprotein feeding, were not observed. The body temperatures and pulse rates were not affected.

These results are of interest since the wide use of iodized salt, as well as many experiments with iodinated casein feeding, have been inconclusive in this country.—*Nutr. Rev., Sept., 1956.*

**Lactation Stimulated in Sows by Feeding Iodinated Casein.**—When 20 sows in Czechoslovakia were given 2 to 4 Gm. of iodinated casein for 28 to 56 days, the weight gain of their pigs was 4 to 5 per cent more than controls. Gains were also improved when it was fed to 10 weanling pigs.—*Vet. Bull., Sept., 1956.*

**Placental Transfer of Calcium.**—Radioactive calcium, given orally to pregnant rats, crossed the placenta at all stages of gestation studied between days 14 to 22. The amount transferred increased with the age of the fetus. The transfer was noticed within 30 minutes after feeding. However, some of the calcium transferred must have been derived from the maternal skeleton.—*Vet. Bull., Sept., 1956.*

## Living with Rabies

It has been well said that whether we live with, or eradicate, a disease depends on our "state of mind." In the United States, we have chosen to eradicate such diseases as bovine tuberculosis and brucellosis but have been satisfied to live with hog cholera and rabies. Until recent years, the choice in Britain was just the reverse, while Canada has chosen to eradicate all of these diseases.

The recent unanimity in the desire of concerned groups to finally swing from control to the eradication of cholera are indeed encouraging. But what about rabies?

Rabies has for too long been tolerated for various reasons, some of which are no credit to man's supposed intelligence. As expressed by one discerning physician, the medical profession has often raised "its voice against the menace of rabies only to be stilled by a small but loud pressure group which operates . . . under the guise of animal lovers."

Whenever any community has been sufficiently frightened by rabies, the result has usually been satisfactory control (*see* p. 57). Nevertheless, there has often been resentment against the methods used; unfortunately, often against the veterinary profession.

### A NEW CONCEPTION OF RABIES CONTROL

Until recent years, rabies was considered as a disease primarily of the canine species with the incidental infection of other species, including man. The immunization of canine pets and elimination of stray dogs was expected to provide control; it has in urban communities.

However, it has now been amply demonstrated that the role played by the bat (pp. 66, 68) as a reservoir of the rabies virus has complicated the prospects for eradication; so has the occasional infection from the bites of many other species—even mice.

The annual national reports indicate that rabies has been reduced about one half in the past decade—10,872 reported cases in all species in 1946, 5,844 in 1955. However, when analyzed, these totals are far from comforting. Rabies in dogs decreased more than two thirds, from 8,384 to 2,657, but the miscellaneous category, composed chiefly of wild animals, doubled, from 956 to

1,915, in that decade. Some of this increase doubtless is due to a more intense search for rabies, but the fact that rabies in cattle has remained constant for a decade, despite the fewer dogs affected, indicates that other creatures are increasingly involved in an infective role.

Meanwhile, as research on reservoirs of the virus continues, control measures should be improved.

### A LAUDABLE CONTROL METHOD

Many communities have done a commendable job of controlling rabies, but perhaps the most noteworthy is described in the *American Journal of Public Health* (Oct., 1955) under "Registration Without Taxation—Denver's Approach to Rabies Control."

For many years, Denver's interest in rabies control had fluctuated from the freezing to the boiling point, depending on the incidence of the disease.

In February, 1950, the issue was hot, with 30 cases of suspected rabies; yet many dog owners were resentful of the "double taxation"—licensure plus vaccination. A new program, therefore, was devised. The chief departures from other programs were: (1) the city license was discontinued; (2) all dogs were to be vaccinated annually during January and February, new dogs immediately when acquired; (3) the veterinarian was to issue a vaccination-registration certificate to the owner, file a duplicate with the department of public health, and affix a tag to the vaccinated dog's collar.

As a result of this popular "one stop service," with the veterinarian's fee the only cost, no rabies has been reported since 1950. Nevertheless, the number of dogs vaccinated has increased from about 20 to 80 per cent of the total dog population, from an average of 6,234 licensed and vaccinated dogs (1940-1949) to an average of 28,657 registered and vaccinated dogs (1950-1954).

This plan should succeed in other communities where a reasonable political approach and an unselfish professional attitude can, together, establish a proper climate of public understanding.

## ABSTRACTS

### Rabies Street Virus in the Hamster

Syrian hamsters showed symptoms of furious rabies on the sixth day after exposure to the dog brain virus. Suspensions from the brain and salivary glands from these animals were injected intracerebrally into Swiss albino mice. The mice showed rabid symptoms between six and ten days and, upon microscopic examination, it was found that all brains contained numerous Negri bodies.

Syrian hamsters exposed to the fox brain virus also showed furious rabies symptoms on the sixth day. The results were similar.—[Reginald L. Reagan, Frances S. Yancey, Sing Chen Chang, and A. L. Brueckner: *Rabies Street Virus in the Syrian Hamster*. *Am. J. Vet. Res.*, 17, (Oct., 1956): 793-794.]

### Appearance Time of Negri Bodies in Mouse Brains

In working with four strains of street rabies virus the authors found that in point of time after intracerebral inoculation of mice, the three diagnostic procedures employed were reliable in the following order: (1) virus isolation, (2) demonstration of complement-fixing antigen, and (3) demonstration of Negri bodies. Two days was observed as the average interval between earliest virus isolation and earliest positive CF reactions and one day elapsed between positive CF findings and the first demonstration of Negri bodies.—[H. Ueki, T. Kato, J. Oisbi, H. Murakami, and K. Shimada: *Observations of the Times of Appearance of Negri Bodies, Complement-Fixing Antigen, and Virulence in Mouse Brains Inoculated with Rabies Street Virus*. *Am. J. Vet. Res.*, 18, (1957): 216-218.]

### The Fungal Flora of Chickens

The lungs and air sacs of 63 birds from 29 flocks were cultured for fungi. The following genera were found: *Aspergillus*, *Penicillium*, *Paecilomyces*, *Cephalosporium*, *Trichoderma*, *Scolariopsis*, and *Mucor*.

*Aspergillus fumigatus* was the pathogen most commonly encountered but it was not found invariably to invade tissue with which it was associated.—[H. L. Chute, D. C. O'Meara, H. D. Tresner, and E. LaCombe: *The Fungous Flora of Chickens with Infections of the Respiratory Tract*. *Am. J. Vet. Res.*, 17, (Oct., 1956): 763-765.]

### Development of the Os Cornu of the Horns of Sheep

In male fetuses of 110 to 120 days of development, the first sign of the future horn core can be recognized as cartilage cells formed on the frontal bone which, until now, is of intramembranous development. During the rest of the gestation period, i.e., between the age of 120 to 145 days,

and during the first few weeks after birth of the lamb, the cartilage cells are formed in increasing numbers at the apex of the cone-shaped process of the frontal bone and lie close to the perichondrium on one side and to the previously formed bone spicules on the other. The replacement of cartilage by bone is recognized as the lamb reaches the age of 6 weeks.

In female horned sheep, the first sign of cartilage formation in the horn site can be recognized in lambs 2 to 3 weeks old. The process of cartilage formation and its growth resembles that described in male lambs.

At the age of 12 weeks, in both sexes, no more cartilage is formed and the previously formed cartilage is gradually replaced by bone.—[A. N. George: *An Important Stage in the Development of the Os Cornu (Bone Core) of the Horns of the Sheep*. *Am. J. Vet. Res.*, 17, (Oct., 1956): 582-587.]

## FOREIGN ABSTRACTS

### Control of Q Fever

The Soviet government has issued instructions for the control of Q fever in livestock. When the disease is suspected, because of human infection, the farm will be quarantined and all animals examined for rhinitis, conjunctivitis, depression, anorexia, abortion, or decreased milk production. Temperatures must be taken daily for 15 days. Blood samples must be taken from all the animals and tested by complement fixation. The critical titer is 1:10 for cattle, sheep, and goats. Tests will be repeated every 25 to 30 days until the herd has given a negative reaction to two successive tests.

Until the herd is released from quarantine, the following will be enforced: (1) No animal may be removed from the infected group for any reason; (2) no animal may be added to the group without the permission of the attending veterinarian; (3) no healthy animal may be placed in a building where animals infected with Q fever have been until the building is thoroughly cleaned and disinfected; (4) animals sick with Q fever may not be slaughtered for meat, nor can their milk be used for human or animal food unless it has been boiled for three to five minutes.—[I. A. Rostovtseva, chief veterinarian, Ministry of Agriculture, U.S.S.R.: *The Diagnosis of Q Fever in Domestic Animals and Measures for Eradication of the Disease*. *Veterinariya*, 33, (July, 1956): 53-56.] —ROBERT E. HABEL.

### Veterinary Control of Artificial Insemination

The Ministry of Agriculture of the U.S.S.R. has initiated a plan to set up artificial insemination studs at district veterinary hospitals. The present system of artificial insemination stations under the administration of the collective farms is unsatisfactory. They do not receive enough attention from agricultural and veterinary authorities. The number of cows inseminated is insignificant. The

personnel do not have the necessary knowledge of physiology, pathology and epizootiology.

Under the new system, it will be possible to organize better control measures against infectious genital diseases and other causes of sterility. The government will provide better sires than are now in use.—[Anon.: *Government Stations for the Artificial Insemination of Animals at Veterinary Hospitals. Veterinariya*, 33, (July, 1956): 94-95.]—ROBERT E. HABEL.

### Blood Transfusions in Domestic Animals

Indications for blood transfusion in domestic animals and various methods of selection of the donor are discussed. The most exact method is to test the blood of 9 donor animals with the blood of 1 receiver. Since this may be difficult or impossible in practice, it is recommended that blood plasma be used for transfusions, since it has almost the same treatment effect as blood and avoids possible dangers from blood transfusions.—[E. Otte: *Contribution to the Blood Transfusion in Domestic Animals. Berl. u. Munch. Tierärztl. Wchschr.*, 69, (1956): 369-373.]—F. KRAL.

### Research on Bovine Blood Groups

In cattle, 42 different blood factors are known. Of these, eight could be differentiated by normal antibodies; all others are differentiated only by immune antibodies. Different breeds of cattle show significant gene differences in these factors.

The blood group determination could be used for various purposes, such as to prove the identity, the descent, potential fertility in twins of different sex; to find a correlation between blood groups; and to determine the inbreeding coefficient in a herd of cattle.—[A. Tolle: *Blood Group Research in Cattle. Berl. u. Munch. Tierärztl. Wchschr.*, 69, (1956): 406.]—F. KRAL.

### BOOKS AND REPORTS

#### Trace Elements in Human and Animal Nutrition

This book is the first of its kind. The author is well known to specialists in animal and human

nutrition. The development of knowledge of the essential trace elements or micronutrients, as they are referred to by some, is described and depicted in an excellent manner. Their historical backgrounds are considered also. There is a chapter on the essential physiological role of each of the following: iron, copper, cobalt, zinc, manganese, and iodine. Replete and conveniently accessible references are listed at the end of each chapter but titles are, regrettably, omitted. Other elements, because of their toxicological significance, or their appearance as traces in animal or human tissues are considered also. Thus, there are chapters on molybdenum, nickel, fluorine, and selenium, each with a wealth of references. Aluminum, arsenic, barium, boron, bromine, silicon, strontium, and vanadium are described in one chapter, with appropriate references. The soil-plant-animal relationship is considered in the last chapter.

The book contains a fount of information relative to the physiological significance of the essential trace elements and their effects on animals and man. Deficiencies, excessive intake, or their imbalance in relation to one another, affecting herds and flocks, are presented in detail. Unfortunately, little consideration is given to the relationship of the essential trace elements, most of which are heavy metals, to complexing with chelating agents.

It is noted that fluorine is not considered an essential element but there is evidence that molybdenum has physiological functions. Iron is listed as a trace rather than a macromineral element, although some English workers place it with the latter. It is pointed out that some of the nonessential trace elements which appear in body tissues may, when in excess, induce impaired function and disease. Essential trace elements can likewise lead to an unhealthy state or disorders of animals and man when in excess or imbalance.

The wealth of practical as well as theoretical information relative to the requirements and the importance of the essential trace elements of animals and man makes it mandatory that this book be placed on the shelf of the specialists in veterinary medicine, medicine, physiology, and animal or human nutrition.—[*Trace Elements in Human and Animal Nutrition. By E. J. Underwood. 430 pages. 29 figures. 47 tables. Academic Press, Inc., New York, N. Y. 1956. Price \$9.50.*]—G. K. L. UNDERBERG.

### The JOURNAL Needs Abstractors

The AVMA receives many foreign periodicals, some of which are abstracted for the JOURNAL by veterinarians who give generously of their time.

At present, our Dutch, Scandinavian, Greek, Turkish, and Chinese journals are not abstracted for the "Current Literature" section. The late Dr. Leunis Van Es, of Omaha, Neb., abstracted the Dutch journals for many years.

The JOURNAL will appreciate inquiries from those who have the time to abstract in any of the languages mentioned. No compensation has ever been provided other than the foreign journals for the abstractor's files.



## Conference of American Board of Veterinary Medical Examiners

This meeting, held Oct. 16, 1956, at the Hilton Hotel, San Antonio, Texas, during the AVMA Convention, was attended by 19 persons; 11 state boards were represented.

The group discussed the desirability of more formal organization than has characterized the conference in recent years and its relationship to the AVMA in so far as its annual meetings are concerned. The difficulties of holding the state boards conference during the crowded convention week were also considered; the possibility of having the conference at some other time was suggested but was not generally approved. It was agreed, however, that a committee should be appointed to study further organization of the conference and, if deemed advisable, to draft a proposed constitution and by-laws for presentation at the next annual meeting.

The program included talks by Dr. Gaylord K. Cooke, secretary of the California State Board, on "Oral and Practical Examinations," in which he outlined methods used by that Board, and by Mr. Charles B. Frasher, personnel consultant of Professional Examination Service, New York, on the objective type examinations developed jointly by P.E.S. and the National Board of Veterinary Medical Examiners and used by several state boards during the past three years as part of their licensure procedure.—Chas. W. Bower, Chairman.

## Drs. E. W. Causey and Adrian M. Mills Head Divisions at Georgia School

Dr. E. W. Causey has been appointed head of the Small Animal Division of the Department of Clinics and Medicine at the University of Georgia.

Born in 1924, in Alamo, Ga., Dr. Causey served with the U. S. Naval Air Corps from 1942 to 1945. He received his D.V.M. degree in 1952, graduating cum laude. Dr. Causey is a member of Phi Kappa Phi, Omega Tau Sigma, and the AVMA. He and Mrs. Causey have two children.



Dr. E. W. Causey

Dr. Adrian M. Mills has been appointed head of the Large Animal Division of the Department of Clinics and Medicine, University of Georgia. Dr. Mills who was born in 1893, graduated from New York State Veterinary College, Cornell University, in 1920, and spent three years on the Parker Ranch in Kamuela, Hawaii. He then served as instructor in surgery at Cornell Univer-



Dr. Adrian M. Mills

sity in 1923; assistant manager of Certified Milk Farms for the Borden Co., 1924-1935; assistant manager of Walker-Gordon Farms, Plainsboro, N. J., 1935-1939; and as veterinarian for the Borden Exhibit at the New York World Fair, 1940. He was in private practice in Earlville, N. Y., from 1940 to 1948 when he became professor of surgery, Department of Medicine at New York State Veterinary College. In 1952, he became professor of medicine and surgery in the School of Veterinary Medicine, University of Georgia. Dr. Mills is a member of the AVMA and Phi Zeta. He and Mrs. Mills have four children.

## Death of Mr. Lloyd

Walter H. Lloyd, general manager of Livestock Conservation, Inc., died suddenly at his home Tuesday night, Dec. 18, 1956. Mr. Lloyd joined L.C.I. in February, 1955, as public relations counsel for this organization and became general manager, Oct. 1, 1955, succeeding Dr. J. R. Pickard. Mr. Lloyd was instrumental in developing a number of action programs designed to reduce livestock losses, principally those occurring in the marketing process.

## U. S. GOVERNMENT

**Dr. Van Houweling Awarded Management Scholarship.**—Dr. C. D. Van Houweling, director, livestock regulatory programs, ARS,

U.S.D.A., was nominated as one of eight federal employees for the American Management Association scholarships. The scholarships cover tuition for the American Management Association's management course designed for executives who wish to strengthen their performance in present responsibilities and to prepare themselves for broader authority.

## AMONG THE STATES AND PROVINCES

### California

**Alameda Contra Costa Association.**—At a meeting of the Alameda Contra Costa Veterinary Medical Association on Oct. 31, 1956, at the Robin Hood Inn, Oakland, a film, demonstration, and discussion of various parenteral techniques were presented by courtesy of Abbott Laboratories.

s/L. S. GOLDSTON, *Secretary*.

### District of Columbia

**District Association.**—The second annual meeting of the District of Columbia Veterinary Medical Association was held on Nov. 20, 1956, at the Sternberg Auditorium, Walter Reed Army Institute of Research, Washington, D.C.

The program included the following speakers and their subjects: Walter L. Newton, National Institutes of Health, Bethesda, Md. (canine filariasis); Morris C. Liken, Armed Forces Institute of Pathology (historian looks at veterinary medicine); Frank A. Todd, Arlington, Va. (veterinarian's obligation in emergencies); Richard E. Shope, Rockefeller Institute for Medical Research, New York, N.Y. (visit to Russia); Charles W. Raker, University of Pennsylvania, Philadelphia (lameness in horses); Robert M. Nims, Walter Reed Institute of Research, and Carl W. Smith, Wheaton, Md. (surgery of the canine thorax); and Roy F. Kinard, Jr., National Institutes of Health, Bethesda, Md. (primate patient).

A luncheon, cocktail hour, and dinner dance were enjoyed by all who attended.

s/C. G. DURBIN, *Secretary*.

### Indiana

**Indiana Auxiliary.**—The executive board of the Women's Auxiliary to the Indiana Veterinary Medical Association met Nov. 15, 1956, in the Pine Shelf Room of the L. A. Pittenger Student Center at Ball State College in Muncie.

Mrs. Lowell Hinchman, president, presented a detailed report of the plans for the annual meeting of the Auxiliary to be held Jan. 16-18, 1957, at the Severin Hotel in Indianapolis. The board meeting was attended by Mrs. Hinchman; Mrs. C. R. Donelson, first vice-president; Mrs. R. W. Worley, second vice-president; and Mrs. Frank Gossett, secretary.

Following this meeting, the group attended the dinner meeting of the Tenth District V.M.A. at

the Delaware Country Club in Muncie. The women of the Tenth District were the official hostesses for the January meeting.

s/MRS. FRANK GOSSETT, *Secretary*.

## DEATHS

★**Lee Seghetti** (WSC '43), 47, Fort Collins, Colo., died at his home on Nov. 20, 1956, from lung cancer. He had been a member of the veterinary faculty at Colorado A. & M. College since 1954.

Born at Lakehead, Wash., in 1909, Dr. Seghetti received his B.S. degree at Washington State College in 1935, his D.V.M. in 1943, and an M.S. degree at Oregon State College in 1948. He was assistant veterinary bacteriologist there in 1938-1939, assistant bacteriologist and pathologist with the U. S. Fish and Wildlife Service in 1939-1941, and graduate assistant in pathology in the veterinary college at Washington State College in 1941-1943. He then served as pathologist in the veterinary research laboratory at Montana State College until 1954. In the latter year, he joined the veterinary faculty at Colorado A. & M. College as parasitologist.

Dr. Seghetti held membership in a number of scientific and honorary societies, was a collaborator in the animal disease and parasite research branch, Agricultural Research Service, U.S.D.A., since 1949, and was author and co-author of numerous papers and bulletins on parasitic diseases of range sheep and cattle, of furbearing and game animals, and clostridial diseases of sheep. He joined the AVMA in 1943.

Surviving are his widow, a daughter, a son, and two sisters. Interment was in Grandview Cemetery, Fort Collins.

★**Colonel Ray J. Stanclift** (ret.) (ONT '96; COR '98), Shawnee, Kan., died Nov. 15, 1956, at the age of 82. Born at Denby, N. Y., in 1874, he was one of that rather small number of veterinarians who served in the "Old Army" prior to 1916, before there was commissioned rank for military veterinarians.

Colonel Stanclift's army career began in 1900 when he was veterinarian with the Eighth U. S. Cavalry, later with the Fifteenth Cavalry, and then was commissioned captain in the newly organized Veterinary Corps in April, 1917. He saw duty at the Mounted Service School at Fort Riley, Kansas, was promoted to major in November, 1917, to lieutenant colonel in July, 1918, and was then assigned to the Surgeon General's office in Washington where he served as consultant to the then director of the Veterinary Corps, Col. C. F. Morse, along with four other veterinary officers. He retired with the rank of colonel in 1930.

Colonel Stanclift joined the AVMA in 1898 and was made an honor roll member in 1948 after 50 years of continuous membership in good standing.

★ Indicates members of the AVMA.

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## Chloromycetin Intramuscular in Shipping Fever in Calves

R. W. Barnes, D.V.M.  
May 1955

**Chloromycetin Intramuscular in Shipping Fever in Calves**  
R. W. Barnes, D.V.M.  
May 1955

This report details the use of Chloromycetin Intramuscular in the treatment of shipping fever in calves. The author describes the clinical presentation, the diagnostic process, and the successful outcome of the treatment with Chloromycetin.

## CHLOROMYCETIN INTRAMUSCULAR IN SHIPPING FEVER IN CALVES

by R. W. Barnes, D.V.M.

Reprint, The North American  
Veterinarian

## The Practical Results of Sensitivity Tests in Small Animal Practice

**The Practical Results of Sensitivity Tests in Small Animal Practice**  
Margaret Schlichting, B.A.

This report presents the results of sensitivity tests conducted in a small animal practice. It discusses the importance of sensitivity testing in selecting the most effective antibiotic for a given infection and provides data on the results of various tests.

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## ORGANIZATION SECTION

### AVMA Research Fellowships Available

The Research Council of the American Veterinary Medical Association announces the availability of a number of fellowships for postgraduate training for the academic year, 1957-1958.

The recipient of a fellowship must be a veterinarian and a citizen of the United States or Canada. Veterinary students who expect to graduate at the end of the current school year and who wish to follow a career in research may apply for a fellowship. The latest date for filing the completed application is March 1, 1957.

The Committee on Fellowships of the Research Council will meet in April to consider applications and the awards will be announced soon afterward. The stipend will be determined in each case by the needs of the individual, the location of the school in which he proposes to work, and other factors. In general, the stipends range from \$100 monthly and upward.

Any qualified person interested in graduate training may obtain application blanks and other information by writing to Dr. C. H. Cunningham, secretary, AVMA Research Council, Department

of Microbiology and Public Health, College of Veterinary Medicine, Michigan State University, East Lansing, Mich.

### Can You Use a Foreign Graduate Assistant?

Recent developments in Hungary have greatly accentuated the problem of placing foreign graduate veterinarians who are among the refugees brought to this country under government and private auspices. The AVMA receives many appeals to find professional employment for foreign graduate veterinarians from Hungary and other European countries.

Most of these displaced veterinarians have had practice experience, others have done disease control, food sanitation, or other work in their homelands.

An occasional offer to employ a foreign graduate is received at AVMA headquarters but the appeals far outnumber the offers.

Any U.S. veterinarian who can utilize a foreign graduate assistant in his practice or hospital is urged to communicate with the AVMA, 600 S. Michigan Ave., Chicago 5, Ill.

### AVMA Group Insurance Program Will Be Launched February 1

All AVMA members in participating states will receive complete details and application blanks by mail shortly after February 1.

Inquiries should be directed to:

AVMA Group Insurance Trust  
Mitchell Hutchinson, C. L. U., Administrator  
Professional Society Group Insurance Co.  
120 South LaSalle St., Chicago 3, Ill.

### Additions to the AVMA Film Library

#### Bovine Contagious Pleuropneumonia

16 mm.	Color:	Produced by Commonwealth Scientific and Industrial Research Organization,	Rental
Sound	Running time 28 min.	Australia	\$2.50

This film reports the incidence of this destructive disease of cattle and depicts with excellent color photography a detailed study of tissue and organs affected by the disease; it shows how this disease, which threatened the American cattle industry 70 years ago, is controlled in Australia where this picture was made by the Commonwealth Scientific and Industrial Research Organization, by vaccination and other measures. A brief statement by Dr. M. R. Clarkson, deputy administrator, Agricultural Research Service, introduces this film.

It is recommended for professional audiences and agricultural groups.

#### Hog Cholera — African Swine Fever, A Comparison

16 mm.	Color:	Produced by U. S. Department of Agriculture and Armed Forces Institute of Pathology	Rental
Sound	Running time 23 min.		\$2.50

This film shows the necropsy of several swine affected with hog cholera, including the characteristic lesions. Although some of the lesions shown are more pronounced than those usually seen in the field, this does not detract from the value of the film. African swine fever, often called "wart hog disease," a highly fatal disease of swine in Africa which closely resembles cholera, is described. The characteristic lesions are shown for comparison with those of hog cholera. Means of differential diagnosis are discussed and are shown in chart form. The



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Many veterinarians have visited our research laboratories, our research farms, our modern mills. We invite you, too, to visit us at any time. In the meantime, we suggest that you get to know the service-minded Purina Dealer in your area.

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color photography vividly shows the gross pathological changes in both diseases. The film is primarily for veterinarians.

It is recommended for teaching purposes as well as showing at veterinary meetings.

## Klot, Its Clinical Applications

16 mm.	Color:	Produced by Warren-Teed Products	Rental
Sound	Running time	Company, Veterinary Division,	\$2.50
	12 min.	Columbus, Ohio	

This film depicts the use of a systemic hemostatic agent, consisting of an aqueous solution of highly refined n-butyl alcohol and dimethyltoluthionine chloride in a normal saline vehicle, in experimental animals; the film also demonstrates its use in a number of surgical procedures.

While the film is of a commercial nature, the method of presentation and techniques demonstrated make it valuable for showing to professional audiences.

## One Against Many

16 mm.	Black and white:	Produced by Hal Roach Studios	Rental
Sound	Running time	and Eastman Kodak Company	\$2.50
	25 min.		

This film is the story of Dr. John R. Mohler's fight against foot-and-mouth disease in California in 1924. It depicts the resistance that was encountered by those who felt that complete eradication of this disease was the only logical approach to be considered.

The film is of historical value, even though a number of technical errors will be apparent to veterinary viewers. Lay audiences viewing the film should enjoy the human interest story and better appreciate the contributions veterinarians have made to maintaining a healthy livestock population.

## WOMEN'S AUXILIARY

President—Mrs. A. E. Coombs, Box 174, Skowhegan, Maine  
Secretary—Mrs. F. R. Booth, 3920 E. Jackson Blvd., Elkhart, Ind.

**Activities of the Auxiliaries to the Student Chapters.**—The Auxiliaries to the AVMA student chapters throughout the country were busy with moneymaking projects during the past year. These projects, which included rummage, cook book, and bakery sales helped send delegates to the AVMA annual convention in San Antonio in October.

Delegates representing schools in Alabama, California, Georgia, Illinois, Iowa, Kansas, Michigan, Minnesota, Missouri, Ohio, Oklahoma, Pennsylvania, and Texas gathered at Texas A. & M. College on Sunday, October 14, for preconvention activities.

These activities included a southern fried chicken box lunch, followed by a tour of the veterinary buildings and animal husbandry and poultry departments. After the tour, a tea in the Memorial Student Center refreshed the delegates. In the evening, the student and auxiliary delegates and Texas A. & M. seniors and their wives attended a banquet in the Center. Entertainment and a talk by Dr. H. A. Smith, head of the pathology department at Texas A. & M., highlighted the evening.

Arriving in San Antonio on Monday morning, the delegates registered at the Gunter Hotel. The girls attended the annual tea given by the Women's Committee of the Local Committee on Monday afternoon.

During the day, exhibits from the student auxiliaries were set up in the Auditorium. These

exhibits, illustrating the various auxiliary activities during the year, included educational and social meetings and money-making and service projects. The service projects included the provision of food and clothing to needy families and the presentation of a bronze plaque inscribed with the Veterinarian's Oath to each graduating senior student. Various forms of the PHT (Pushing Hubby Through) diploma were displayed. Most auxiliaries are fortunate in having classes for senior wives taught by staff members of the veterinary school. One auxiliary scheduled a talk on how to prepare meals that will wait, by a home economist at their social meeting.

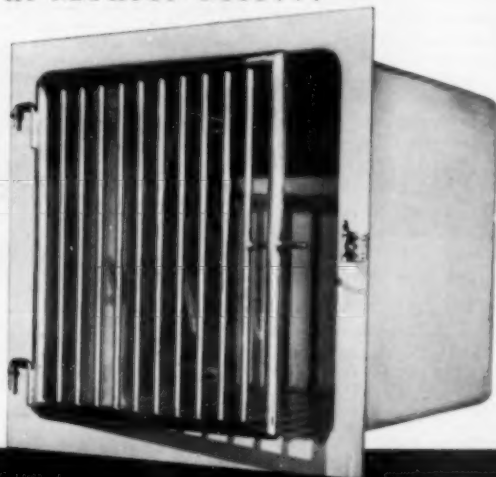
Student auxiliary delegates were honored guests at the meeting of the auxiliary house of representatives on Tuesday morning, when loans to veterinary students were increased, with a decrease in rate of interest, and the constitutional amendment was passed enabling student auxiliaries to become affiliated with the AVMA Auxiliary if their sponsors are members in good standing of the AVMA Auxiliary.

Tuesday noon, student and auxiliary delegates, their sponsors, deans of the schools of veterinary medicine, and the national officers of the AVMA and the AVMA Auxiliary attended a buffet luncheon. Immediately following, the student auxiliary delegates held their annual meeting, with Mrs. L. H. Moe, first vice-president of the AVMA Auxiliary, presiding. Mrs. A. E. Coombs, acting president, spoke to the group of the importance of public relations and the role student wives can play in promoting veterinary medicine.

Suggestions made by the delegates included

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having the exhibits displayed at the meetings of the House of Representatives and of the student auxiliary delegates, rather than in the convention hall with the other exhibits. Mrs. Moe announced that the newsletter for the auxiliaries would continue to be published three times a year. The delegates attended the annual AVMA Auxiliary luncheon and style show at Seven Oaks Country Club on Wednesday.

All student auxiliary delegates present felt that a greater knowledge of the AVMA Auxiliary was gained and that each delegate would urge her local auxiliary members to give their wholehearted support to the organization when they become eligible for membership.

MRS. FRANCIS MCGRADY,  
Student Auxiliary Delegate,  
Michigan State University.

## COMING MEETINGS

Tennessee Veterinary Medical Association. Annual meeting. Memphis, Tenn., Jan. 13-15, 1957. H. W. Hayes, 5009 Clinton Pike, Knoxville, secretary.

Oklahoma Veterinary Medical Association. Annual meeting. Hucksins Hotel, Oklahoma City, Jan. 13-15, 1957. M. N. Riemenschneider, 122 State Capitol Building, Oklahoma City, secretary.

Indiana Veterinary Medical Association. Annual meeting. Hotel Severin, Indianapolis, Jan. 16-18, 1957. L. M. Borst, 3315 Shelby, Indianapolis, Ind., secretary.

Michigan State University. Conference for veterinarians. College of Veterinary Medicine, East Lansing, Jan. 22-23, 1957. C. F. Clark, dean.

Iowa Veterinary Medical Association. Annual meeting. Hotel Fort Des Moines, Iowa, Jan. 22-24, 1957. F. B. Young, Waukegan, Iowa, secretary.

North Carolina State College. Conference for veterinarians. North Carolina State College, Raleigh, Jan. 22-25, 1957. C. D. Grinnells, chairman.

Maryland State Veterinary Medical Association. Annual meeting. Lord Baltimore Hotel, Baltimore, Jan. 23-24, 1957. John D. Gadd, Cockeysville, Md., secretary.

Intermountain Veterinary Medical Association. Twentieth annual meeting. Hotel Utah, Salt Lake City, Utah, Jan. 24-26, 1957. R. A. Bagley, 2387 East 39th South St., Salt Lake City, Utah, secretary.

Virginia Veterinary Medical Association. Annual meeting. Hotel John Marshall, Richmond, Va., Jan. 27-29, 1957. W. B. Bell, 1303 Hillcrest Dr., Blacksburg, secretary.

California State Veterinary Medical Association. Midwinter conference. School of Veterinary Medicine, University of California, Davis, Jan. 28-30, 1957. Charles S. Travers, 3004 16th St., San Francisco, executive secretary.

Arkansas Veterinary Medical Association. Annual meeting. Hotel Marion, Little Rock, Jan. 29-30, 1957. W. M. Taegel, 912 Linden St., Pine Bluff, Ark., secretary.

Louisiana State University. Conference for veterinarians. Pleasant Hall, Louisiana State University, Baton Rouge, Jan. 29-30, 1957. W. T. Oglesby, head, Department of Veterinary Science.

Minnesota State Veterinary Medical Association. Annual

meeting. Radisson Hotel, Minneapolis, Feb. 4-6, 1957. B. S. Pomeroy, 1443 Raymond Ave., St. Paul 8, secretary.

Kansas Veterinary Medical Association. Annual meeting. Lamer Hotel, Salina, Feb. 6-8, 1957. K. Maynard Curtis, 5236 Delmar Ave., Kansas City 3, Kan., secretary.

New Jersey Veterinary Medical Association. Annual meeting. Berkeley Carteret Hotel, Asbury Park, Feb. 13-14, 1957. J. R. Porteus, P. O. Box 938, Trenton 5, N. J., resident secretary.

Nevada State Veterinary Association. Annual meeting. Ranch Inn, Elko, Feb. 15-16, 1957. W. F. Fisher, 1465 Wells Ave., Reno, Nev., secretary.

Missouri Veterinary Medical Association. Annual meeting. Chase Hotel, St. Louis, Feb. 15-16, 1957. Paul L. Spencer, P. O. Box 283, Jefferson City, Mo., secretary.

Colorado A. & M. College. Annual conference for veterinarians. Colorado A. & M. College, Veterinary Hospital, Fort Collins, Feb. 18-20, 1957. O. R. Adams, head, Veterinary Clinics and Surgery.

Illinois State Veterinary Medical Association. Annual convention. La Salle Hotel, Chicago, Feb. 25-27, 1957. C. B. Hostetler, 1385 Whitcomb Ave., Des Plaines, Ill., executive secretary.

Washington, State College of. Annual conference for veterinarians. Pullman, Wash., April 8-10, 1957. Ray E. Watts, conference secretary.

Texas A. & M. College. Conference for veterinarians. Texas A. & M. College, College Station, June 6-7, 1957. R. D. Turk, chairman.

## Lederle Leaves Veterinary Field — New Division Created by Cyanamid

An expanded product line for the sole use of veterinarians is one of the changes brought about by the formation of a new division within American Cyanamid Company, to be known as the Farm and Home Division, and which went into operation Jan. 1, 1957. One of its largest sections is a Professional Services Department devoted to meeting the growing and changing needs of veterinary practitioners.

Creation of the Professional Services Department marks the end of the Lederle Laboratories Division's marketing of veterinary products, many of which, with new ones yet to come, will be absorbed by the new department. It brings together under one group the units of the company that have common research, product development, merchandising, and marketing interests in the animal health field.

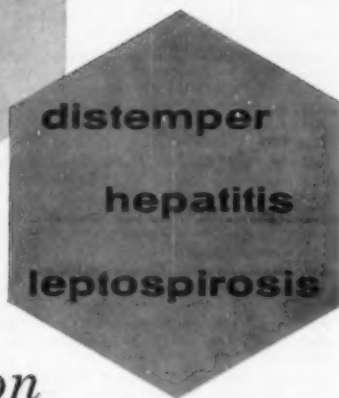
A. B. Clow, formerly general manager of Cyanamid's Fine Chemicals Division, and the general manager of the Farm and Home Division, said:

"The Professional Services Department will offer a broadened product line designated for the exclusive use of veterinarians . . . to be sold under the Red Line label. Red Line products are entirely dependent on the sound, clinical judgment of the practicing veterinarian. They will not be available to any other group."

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## Regularly Scheduled Meetings

**ALABAMA**—Central Alabama Veterinary Association, the first Thursday of each month. B. M. Lauderdale, Montgomery, secretary.

Jefferson County Veterinary Medical Association, the second Thursday of each month. S. A. Price, 213 N. 15th St., Birmingham, secretary.

Mobile-Baldwin Veterinary Medical Association, the first Tuesday of each month. W. David Gross, 771 Holcombe Ave., Mobile, Ala., secretary.

**ARIZONA**—Central Arizona Veterinary Medical Association, the second Tuesday of each month. Keith T. Maddy, Phoenix, Ariz., secretary.

Southern Arizona Veterinary Medical Association, the third Wednesday of each month at 7:30 p.m. E. T. Anderson, Rt. 2, Box 697, Tucson, Ariz., secretary.

**CALIFORNIA**—Alameda Contra Costa Veterinary Medical Association, last Wednesday of each month. Leo Goldston, 3793 Broadway, Oakland 11, Calif., secretary.

Bay Counties Veterinary Medical Association, the second Tuesday of each month. E. Paul, Redwood City, Calif., secretary.

Central California Veterinary Medical Association, the fourth Tuesday of each month. R. B. Barsaleau, 2333 E. Mineral King, Visalia, Calif., secretary.

Kern County Veterinary Medical Association, the first Thursday evening of each month. A. L. Irwin, 301 Taft Highway, Bakersfield, Calif., secretary.

Mid-Coast Veterinary Medical Association, the first Thursday of every even month. W. H. Rockey, P. O. Box 121, San Luis Obispo, Calif., secretary.

Monterey Bay Area Veterinary Medical Association, the third Wednesday of each month. Lewis J. Campbell, 90 Corral de Tierra, Salinas, Calif., secretary.

North San Joaquin Valley Veterinary Medical Association, the fourth Wednesday of each month at the Hotel Co-

vell, in Modesto, Calif. Lyle A. Baker, Turlock, Calif., secretary.

Orange Belt Veterinary Medical Association, the second Monday of each month. Chester A. Maeda, 766 E. Highland Ave., San Bernardino, Calif., secretary.

Orange County Veterinary Medical Association, the third Thursday of each month. Donald E. Lind, 2643 N. Main St., Santa Ana, Calif., secretary.

Peninsula Veterinary Medical Association, the third Monday of each month. T. D. Harris, San Mateo, Calif., secretary.

Redwood Empire Veterinary Medical Association, the third Thursday of each month. Robert E. Clark, Napa, Calif., secretary.

Sacramento Valley Veterinary Medical Association, the second Wednesday of each month. W. E. Steinmetz, 4227 Freepoint Blvd., Sacramento, Calif., secretary.

San Diego County Veterinary Medical Association, the fourth Tuesday of each month. H. R. Rossoll, 1795 Moore St., San Diego, Calif., secretary.

San Fernando Valley Veterinary Medical Association, the second Friday of each month at the Casa Escobar Restaurant in Studio City. John Chudacoff, 7912 Sepulveda Blvd., Van Nuys, secretary.

Southern California Veterinary Medical Association, the last Wednesday of each month. Don Mahan, 1919 Wilshire Blvd., Los Angeles 57, Calif., executive secretary.

Tulare County Veterinarians, the second Thursday of each month. R. B. Barsaleau, 2333 E. Mineral King, Visalia, Calif., secretary.

**COLORADO**—Denver Area Veterinary Society, the fourth Tuesday of every month. Richard C. Tolley, 5060 S. Broadway St., Englewood, Colo., secretary.

Northern Colorado Veterinary Medical Society, the first Monday of each month. M. A. Hammarlund, School of Veterinary Medicine, Colorado A. & M. College, Fort Collins, Colo., secretary.



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For example, the higher biological value of International's dicalcium phosphate—DynaFOS—as shown in the chart below, means more usable phosphorus, less "phantom" phosphorus.

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SPECIFICATIONS	DYNAFOS	SOFT 3R COLLOIDAL PHOSPHATE	CURACAO ISLAND PHOSPHATE	BONE MEAL
1. PHOSPHORUS CONTENT	18.5%	9.0	14.0%	13%
2. DYNAMIC (BIOLOGICAL) VALUE	100	Less than 35	70	70-100
3. LBS. OF USABLE PHOSPHORUS PER TON	370 lbs.	Less than 45.0 lbs.	196 lbs.	182-260 lbs.
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**DELAWARE**—New Castle County Veterinary Association, the first Tuesday of each month at 9:00 p.m. in the Hotel Rodney, Wilmington, Del. E. J. Hathaway, Clifton Park Manor, Apt. 73-5, Wilmington 2, Del., secretary.

**FLORIDA**—Central Florida Veterinary Medical Association, the second Friday of each month, time and place specified monthly. James B. Murphy, Eustis, Fla., secretary.

Jacksonville Veterinary Medical Association, the second Thursday of each month, time and place specified monthly. George F. Yopp, 4644 Main St., Jacksonville, Fla., secretary.

Northwest Florida Veterinary Medical Society, third Wednesday of each month, time and place specified monthly. Harold A. Tennant, Atmore, Ala., secretary.

Palm Beach Veterinary Society, the last Thursday of each month in the county office building at 816 Datura St., West Palm Beach. Ross E. Evans, 5215 S. Dixie Highway, West Palm Beach, Fla., secretary.

Ridge Veterinary Medical Association, the fourth Thursday of each month in Bartow, Fla. Paul J. Myers, Winter Haven, Fla., secretary.

South Florida Veterinary Society, the third Tuesday of each month, at the Seven Seas Restaurant, Miami, Fla. E. D. Stoddard, 6432 S. W. 8th St., Miami, Fla., secretary.

Suwannee Valley Veterinary Association, the third Friday of each month, at the Thomas Hotel, Gainesville, Fla. R. C. Mann, Rt. 1, Box 37, Ocala, Fla., secretary.

Volusia County Veterinary Medical Association, the fourth Thursday of each month. A. E. Hixon, 131 Mary St., Daytona Beach, Fla., secretary.

**GEORGIA**—Atlanta Veterinary Society, the second Tuesday of every month at the Elks Home on Peachtree St., Atlanta, Ga. J. L. Christopher, Smyrna, Ga., secretary.

**ILLINOIS**—Chicago Veterinary Medical Association, the second Tuesday of each month. Mark E. Davenport, Jr., 215 S. Edgewood Ave., LaGrange, Ill., secretary.

Eastern Illinois Veterinary Medical Association, the first Thursday of March, June, September, and December. A one-day clinic is held in May. H. S. Bryan, College of Veterinary Medicine, University of Illinois, Urbana, secretary.

**INDIANA**—Central Indiana Veterinary Medical Association, the second Wednesday of each month. Peter Johnson, Jr., 4410 N. Keystone Ave., Indianapolis 5, secretary.

Michiana Veterinary Medical Association, the second Thursday of every month except July and December, at the Hotel LaSalle, South Bend, Ind. J. M. Carter, 3421 S. Main St., Elkhart, Ind., secretary.

Tenth District Veterinary Medical Association, the third Thursday of each month. W. E. Sharp, Union City, Ind., secretary.

**IOWA**—Cedar Valley Veterinary Association, the second Monday of each month, except January, July, August, and October, at Black's Tea Room, Waterloo, Iowa. H. V. Henderson, Reinbeck, Iowa, secretary.

Coon Valley Veterinary Association, the second Wednesday of each month, September through May, at the Bradford Hotel, Storm Lake, Iowa. D. I. Lee, Sac City, Iowa, secretary.

Fayette County Veterinary Association, the third Tuesday of each month, except in July and August, at Pa and Ma's Restaurant, West Union, Iowa. Donald E. Moore, Box 178, Decorah, Iowa, secretary.

Northeast Iowa-Southern Minnesota Veterinary Association, the first Tuesday of February, May, August, and November at the Wisneslick Hotel, Decorah, Iowa, 6:30 p.m. Donald E. Moore, Box 178, Decorah, Iowa, secretary.

**KENTUCKY**—Central Kentucky Veterinary Medical Association, the first Wednesday of each month. L. S. Shirrell, Versailles Rd., Frankfort, secretary.

Jefferson County Veterinary Society of Kentucky, Inc., the first Wednesday evening of each month in Louisville.

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*Mikedimide* has a high therapeutic index, and no signs of toxicity have been observed. Animals can be put to sleep or awakened almost at will, by the alternate use of barbiturate and *Mikedimide* without any apparent harm to the animal.

We present below abstracts of a few typical case reports pertaining to the use of *Mikedimide*:

Morphine sulfate (0.5 gr.) was administered subcutaneously and 3 cc. (180 mg.) of pento barbital sodium was given intravenously to a deep surgical plane. The subject suddenly ceased breathing. The heart was weak and reflexes were absent. Two and one-half minutes after respiratory arrest, 105 mg. of *Mikedimide* was given slowly intravenously. The amplitude of respiratory movements markedly increased. Reflexes returned within one and one-half minutes. The operation and recovery were uneventful. The sleeping time was shortened about two hours.

The patient was in shock and appeared to be a poor surgical risk. A single injection (45 mg.) of pentothal sodium was administered intravenously. Respiration ceased before the injection was completed. The heart was weak and all reflexes were absent. Within 30 seconds after respiratory arrest, 1 cc. (30 mg.) of *Mikedimide* was given intravenously. Respiration was resumed within 15 seconds. The heart became strong and the palpebral reflex returned in one and one-half minutes. Recovery was uneventful.

The patient was anesthetized with aural sodium (480 mg.), given intravenously. Reflexes were absent, respiration was slightly depressed and the heart was strong. Six minutes after anesthesia, *Mikedimide* (120 mg.) was injected slowly intravenously. There was an immediate respiratory response. The palpebral reflex returned at once. At the end of the *Mikedimide* injection, the dog tried to lift his head and sniffed the operating table. Fourteen minutes after the *Mikedimide* injection, the dog was almost conscious. The sleeping time was shortened by 50 percent and recovery was uneventful.

**MIKEDIMIDE**  
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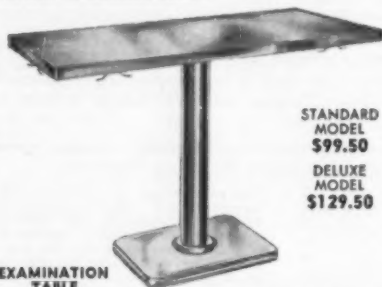
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**MARYLAND**—Baltimore City Veterinary Medical Association, the second Thursday of each month, September through May (except December), at 9:00 p.m. at the Park Plaza Hotel, Charles and Madison St., Baltimore, Md. Harry L. Schultz, Jr., 9011 Harford Rd., Baltimore, Md., secretary.

**MICHIGAN**—Mid-State Veterinary Medical Association, the fourth Thursday of each month with the exception of November and December. Robert E. Kader, 5034 Armstrong Rd., Lansing 17, Mich., secretary.

Saginaw Valley Veterinary Medical Association, the last Wednesday of each month. S. Correll, Rt. 1, Midland, Mich., secretary.

Southeastern Veterinary Medical Association, the fourth Wednesday of every month, September through May. Gilbert Meyer, 14003 E. Seven Mile Rd., Detroit 5, Mich., secretary.

**MISSOURI**—Greater St. Louis Veterinary Medical Association, the first Friday of the month (except July and August) at the Sheraton Hotel, Spring Ave. and Lindell Blvd. Allen B. Shopmaker, 136 N. Meramec, Clayton 5, Mo., secretary.

Kansas City Small Animal Hospital Association, the first Monday of each month, at alternating hospitals. W. F. Noland, 7504 Metcalf, Overland Park, Kan., secretary.

Kansas City Veterinary Medical Association, the third Tuesday of each month at Exchange Hall, ninth floor, Livestock Exchange Bldg., 1600 Genessee St., Kansas City, Mo. Busch Meredith, 800 Woodsworth Rd., Kansas City 5, Mo., secretary.

**NEW JERSEY**—Central New Jersey Veterinary Medical Association, the second Thursday of November, January, March, and May at Old Hights Inn, Hightstown, N. J. David C. Tudor, Cranbury, N. J., secretary.

Metropolitan New Jersey Veterinary Medical Association, the third Wednesday evening of each month from October through April at the Academy of Medicine, 91 Lincoln Park South, Newark, N. J. Myron S. Arlein, 2172 Milburn Ave., Maplewood, N. J., secretary.

Northern New Jersey Veterinary Association, the fourth Tuesday of each month at the Casa Mana in Teaneck. James R. Tanzola, Upper Saddle River, secretary.

Northwest Jersey Veterinary Society, the third Wednesday of every odd month. F. B. Duke, 49 Taylor St., High Bridge, N. J., secretary.

Southern New Jersey Veterinary Medical Association, the third Tuesday of each month at the Collingswood Veterinary Hospital, Collingswood. W. E. Snyder, E. Kings Highway and Munn Ave., Haddonfield, secretary.

**NEW YORK**—New York City, Inc., Veterinary Medical Association of, the first Wednesday of each month at the New York Academy of Sciences, 2 East 63rd St., New York City. C. E. DeCamp, 43 West 61st St., New York 23, N. Y., secretary.

Monroe County Veterinary Medical Association, the first Thursday of even-numbered months except August. Irwin Bircher, 50 University Ave., Rochester, N. Y., secretary.

**NORTH CAROLINA**—Central Carolina Veterinary Medical Association, the second Wednesday of each month at 7:00 p.m. in the O'Henry Hotel, Greensboro. Joseph A. Lombardo, 411 Woodlawn Ave., Greensboro, secretary.

Eastern North Carolina Veterinary Medical Association, the first Friday of each month. Wm. Allen Potts, 401 W. James St., Mount Olive, secretary.

Piedmont Veterinary Medical Association, the last Friday of each month. John G. Martin, Boone, N. Car., secretary.

**OHIO**—Cuyahoga County Veterinary Medical Association, the first Wednesday of each month, September through May (except January), at 9:00 p.m. at the Carter Hotel, Cleveland, Ohio. Ed. R. Jacobs, 5522 Pearl Rd., Cleveland, Ohio, secretary.



WHENEVER **STRESS**  
BECOMES  
A COMPLICATING FACTOR...

## **METICILLIN** Aqueous Suspension **VETERINARY**

**corticosteroid-antibiotic therapy... combining  
for enhanced therapeutic effectiveness in the  
treatment of pneumonias**

**METICORTEN**, a superior antiinflammatory agent, plus  
**PENICILLIN**, specific against gram-positive bacteria.

also indicated in  
acute and secondary infections • foot rot •  
accident cases • surgical procedures  
... extremely useful as supportive therapy

METICORTEN,\* brand of prednisone.

METICILLIN,\* brand of procaine penicillin for aqueous injection with prednisone.

\*T.M. V-MN-J-117

SCHERING CORPORATION, BLOOMFIELD, NEW JERSEY

### **Packaging:**

**METICILLIN Aqueous  
Suspension Veterinary**, 10 cc.  
vial, 10 mg. prednisone  
and 300,000 units procaine  
penicillin G in  
each cc., boxes of 1, 6, 72.

*Schering*



**BREAK  
THE**

**ITCH-SCRATCH  
-ITCH  
CYCLE**

by effective control of both  
the **inflammation and infection**

**METIMYD** OINTMENT  
WITH NEOMYCIN VETERINARY

**the new topical therapy**

combining METICORTELONE Acetate and two antibacterials, acts promptly to relieve excessive inflammatory and allergic reactions to infections, allergens and trauma. It has been found particularly effective in nonspecific eczemas, allergic skin disorders and ear canker.

METIMYD offers the assured Meti-steroid benefits of prednisolone acetate (0.5%), plus the wide range antibacterial action of sulfacetamide sodium (10%) and neomycin sulfate (0.25%).

**Packaging:** METIMYD Ointment, 1/2 oz. applicator tube, boxes of 1, 12, 36.

METICORTELONE,\* brand of prednisolone.  
METIMYD,\* brand of prednisolone acetate and sulfacetamide sodium.  
\*T.M. V. MM-J-117

SCHERING CORPORATION, BLOOMFIELD, NEW JERSEY

*Schering*

## IN MASTITIS

**CHECK** inflammation promptly  
**ERADICATE** infection  
**REDUCE** secretory tissue damage

## METIBIOTIC

**mastitis infusion VETERINARY**



bridge the therapeutic gap in mastitis by reducing inflammation. In METIBIOTIC the more potent antiinflammatory properties of METICORTEN complement the wide antibacterial spectrum of **penicillin-dihydrostreptomycin**, which are bactericidal to the majority of mastitis organisms.

This combined action results in prompt penetration of the clogged ducts and high, sustained antibiotic levels. Recovery is rapid, usually following a single infusion, and milk production returns to normal generally within 24 to 36 hours.

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METICORTEN,\* brand of prednisone.

METIBIOTIC,\* brand of procaine penicillin-dihydrostreptomycin in oil with prednisone acetate.

\*T.M. V-MB-J-117

*double therapy*

*in diarrheas of animals, both  
anticholinergic and antibacterial*



## **VARITON Compound**

VETERINARY

**...blocks  
parasympathetic  
nerve impulses  
to the GI tract**

the anticholinergic, **diphemanil  
methysulfate**, decreases peristalsis, reduces  
secretions and suppresses inflammation

the antibacterial, **phthalylsulfacetamide**,  
penetrates all layers of the intestinal wall for  
more effective treatment of enteric infections

**packaging:**

**large animals:**

VARITON Compound boluses,  
jar of 24 boluses;  
6 jars, 24 boluses per jar.

**small animals:**

VARITON Compound Tablets  
bottle of 100.

VARITON® Compound, brand of diphemanil methysulfate  
and phthalylsulfacetamide.

*Schering*

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in

## RUMATONE IMPROVED

*for increased peristaltic action*

tartar  
emetic

ginger and  
capsicum

sodium  
thiosulfate

milk of  
magnesia

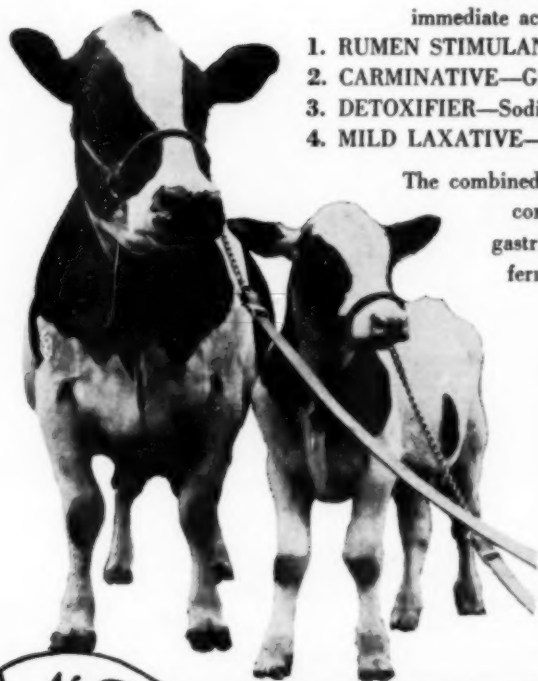
**rumatone improved** is an effective rumenatoric, antacid and anti-ferment combined with the mild laxative action of milk of magnesia. *Rumatone Improved* starts immediate action as a:

1. RUMEN STIMULANT—Tartar Emetic and Nux Vomica
2. CARMINATIVE—Ginger and Capsicum
3. DETOXIFIER—Sodium Thiosulfate
4. MILD LAXATIVE—Milk of Magnesia

The combined action of **RUMATONE IMPROVED** corrects atony of the rumen, relieves toxic gastritis, and the bloat which comes from fermentation or overloading in ruminants.

### directions:

Mix contents of bottle in 1 gallon of water, stir thoroughly and give as drench or with stomach tube. Cattle, one gallon of this mixture, sheep and calves, one pint to one quart of this mixture.



NLC

SERVING GRADUATE VETERINARIANS EXCLUSIVELY

THE  
**NATIONAL LABORATORIES**  
CORPORATION  
KANSAS CITY

good traveling companion  
for faster, safer antibiotic therapy—

# STECLIN

HYDROCHLORIDE

SQUIBB TETRACYCLINE HYDROCHLORIDE

- broad spectrum anti-microbial activity
- fewer undesirable side effects
- 3 easy-to-use forms

**HERE'S A SAFE AND EFFICIENT "LIFE SAVER"**—One that makes the most of every minute you use "on call." It's Steclin Squibb. Keep an adequate supply in your bag, in its three easy-to-administer forms. Then, when broad spectrum antibiotic therapy is indicated, you know you're prepared to treat a wide range of diseases at a moment's notice, including those caused by gram-positive and gram-negative bacteria, spirochetes, certain rickettsias, and certain large viruses.

**STECLIN IS UNUSUALLY WELL TOLERATED** by both large and small animals, resulting in a remarkably low incidence of the gastro-intestinal side effects which often complicate recovery after therapy with other antibiotics. Steclin is promptly absorbed into the bloodstream, effectively penetrates body tissues and fluids including the cerebrospinal, peritoneal and pleural, and reaches high levels in the urine.

## SUPPLY

New Steclin Soluble Powder is available in ½ lb. bottles, each containing 12½ grams tetracycline hydrochloride. Also:

**CAPSULES:** 50 mg., 100 mg., and veterinary sizes of 250 mg.

**INTRAMUSCULAR:** Veterinary sizes of 100 mg., 1 gram, 2.5 grams

**INTRAVENOUS:** 250 mg., 500 mg.

## DOSAGE:

**ORAL:** *Small animals*, 10-50 mg. per lb. of body weight per day in divided doses; *large animals*, 5-10 mg. per lb. of body weight per day.

**IV OR IM:** *Small animals*, 2.5 mg. per lb. daily; *large animals*, initially 2 grams followed by 1 gram daily for 3 or 4 days or until recovery.



**STECLIN IS SOLD ONLY TO VETERINARIANS**



# SOLUBLE POWDER



# VIALS



# CAPSULES



## INDICATIONS:

*Steclin is indicated in the treatment of the following conditions when due to tetracycline-susceptible organisms:*

Bacterial infections associated with canine distemper; bronchitis; calf scours; enteritis; equine influenza; erysipelas; feline enteritis; hemorrhagic septicemia; infectious coryza; influenza; lamb dysentery; leptospirosis in dogs; metritis; nephritis; otitis media; parotitis; peritonitis; pharyngitis; pneumonia; pyelonephritis; septic mastitis; staphylococcal and streptococcal infections in the foal; tonsillitis; ulcerations; upper respiratory complications; urinary tract infections.

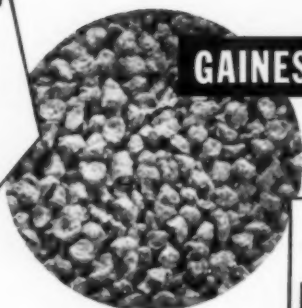
**STECLIN IS AVAILABLE** upon prescription from your pharmacy, through your wholesaler, or from your favorite veterinary supply house. For further information about Steclin, or other Squibb veterinary products, write: SQUIBB, Veterinary Products Department, 745 Fifth Avenue, New York 22, N. Y.

**SQUIBB QUALITY**

—THE PRICELESS INGREDIENT

Steclin is a Squibb trademark.

*the big  
difference  
here...*



**GAINES MEAL**

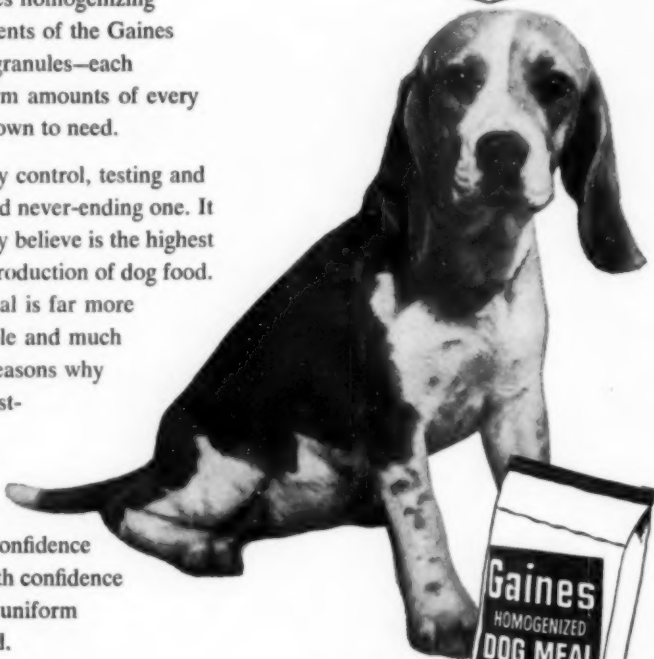
*makes a  
big difference  
here...*

**Yes, Gaines makes the difference**

because the special Gaines homogenizing process combines ingredients of the Gaines formula into appetizing granules—each granule containing uniform amounts of every food element dogs are known to need.

Gaines program of quality control, testing and research is an exacting and never-ending one. It results in what we honestly believe is the highest standard possible in the production of dog food. Gaines Homogenized Meal is far more assimilable, more palatable and much easier to feed . . . good reasons why Gaines is America's largest-selling dog meal.

Gaines indeed makes the difference . . .  
you can use Gaines with confidence  
. . . recommend Gaines with confidence  
. . . because complete and uniform nourishment is guaranteed.

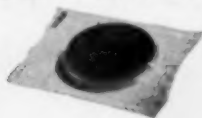


A Product of General Foods

**Gaines** **HOMOGENIZED  
DOG MEAL**



In the field...or in your clinic



**PRE-MED**

(prepared medium)

*the disposable culture plate sealed in a sterile bag*

## 9 MEDIA NOW AVAILABLE

*for routine bacteriology*

Blood Agar  
Chocolate Agar  
E. M. B. Agar

MacConkey Agar  
S S Agar  
Bismuth Sulfite Agar

*for routine mycology*

Sabouraud Dextrose Agar  
Mycosel Agar  
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PRE-MEDS are optically clear, scratch-free Petri dishes containing *ready-to-streak* culture media. For maximum shelf life, each PRE-MED is sealed in a sterile polyethylene bag to preserve moisture and prevent air contamination. (Bag may be resealed for prolonged incubation.)

Gone are the tedious hours of preparing glass Petri dishes for re-use. Gone are the troubles that go with mixing your own culture media. Let Hyland do it for you—with modern, controlled,

mass production methods. You get perfect, uniform, sterile preparations at what cost-conscious laboratories agree is actually less than "do-it-yourself" costs.

With PRE-MED, even perishable specimens become routine to handle. Simply open a bag, streak the plate, incubate—and after reading, destroy. Enjoy PRE-MED advantages now. In units of 3 plates of any one medium (minimum order) —50¢ per plate. Lower cost in quantity.



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Tulsa Veterinary Medical Association, the third Thursday of each month in Directors' Parlor of the Brookside State Bank, Tulsa, Okla. Don L. Hohmann, 538 S. Madison St., Tulsa, Okla., secretary.

**PENNSYLVANIA**—Keystone Veterinary Medical Association, the fourth Wednesday of each month at the University of Pennsylvania School of Veterinary Medicine, 39th and Woodland Ave., Philadelphia 4, Pa. Raymond C. Snyder, 39th and Woodland Ave., Philadelphia 4, Pa., secretary.

**SOUTH CAROLINA**—Piedmont Veterinary Medical Association, the third Wednesday of each month at the Fairforest Hotel, Union, S. Car. Worth Lanier, York, S. Car., secretary.

**TEXAS**—Coastal Bend Veterinary Association, the second Wednesday of each month. J. Marvin Prewitt, 4141 Lexington Blvd., Corpus Christi, Texas, secretary.

**VIRGINIA**—Central Virginia Veterinarians' Association, the third Thursday of each month at the William Byrd Hotel in Richmond at 8:00 p.m. M. R. Levy, 312 W. Cary St., Richmond 20, Va., secretary.

Northern Virginia Veterinary Society, the second Wednesday of every third month. Meeting place announced by letter. H. C. Newman, Box 145, Merrifield, Va., secretary.


Southwest Virginia Veterinary Medical Association, the first Thursday of each month. I. D. Wilson, Blacksburg, secretary.

**WASHINGTON**—Seattle Veterinary Medical Association, the third Tuesday of each month in the Trinity Episcopal Church, 8th and James St., Seattle, Wash. P. R. Des Rosiers, 5508 2nd Ave., N. W., Seattle 7, Wash., secretary.

South Puget Sound Veterinary Association, the second Thursday of each month except July and August. O. L. Bailey, P. O. Box 906, Olympia, Wash., secretary.

**WEST VIRGINIA**—Kyowva (Ky., Ohio, W. Va.) Veterinary Medical Association, the second Thursday of each month in the Hotel Prichard, Huntington, W. Va., at 8:30 p.m. Harry J. Fallon, 200 5th St., W. Huntington, W. Va., secretary.

**WISCONSIN**—Milwaukee Veterinary Medical Association, the third Tuesday of each month, at the Half-Way House, Blue Mound Rd. George F. Lynch, 201 West Devon St., Milwaukee 17, Wis., secretary.



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**W W CATTLE CHUTE**

- The Chute with a Side Exit
- Left or Right Side Brand
- Automatic Head Adjuster
- Also Calf Cradles, Corals, Feeder Bunks, and Stock Racks for Pickets

Dealers Wanted  
W W CATTLE CHUTE COMPANY  
Dodge City, Kansas

**The World's Finest Cattle Handling Equipment**

## Keep Teat OPEN — Keep It MILKING

To maintain unrestricted milk flow and provide antiseptic protection is of first importance in the care of injured teats, Scab teats, Stenosis, and in post operative therapy. Dr. Naylor Medicated Teat Dilators are SULFA-impregnated surgical dressings for the teat canal.

They act both medically and mechanically to provide prolonged broad spectrum germicidal activity and gentle non-irritating support to traumatized sphincter and teat mucosa. They promote normal tissue repair with a minimum of altered milking function of the streak canal. Positive retention—fit large or small teats.

### WITH ANTIBIOTICS

The soft, highly absorbent properties of Dr. Naylor Dilators make them an ideal vehicle for additional local medication of your choice. To obtain the synergistic bactericidal action of Antibiotics and Sulfathiazole following teat surgery, saturate with your favorite udder infusion antibiotic.

**Dr. Naylor's**

**MEDICATED TEAT DILATORS**

DISPENSING PACKAGE (Contains 16 Dilators) \$4.00 per doz. —>



Have you used **BLU-KOTE** for Cowpox\*, Ringworm, Moist Lesions, Skin Abrasions? Blu-Kote dries oozing lesions, reduces pus formation, controls secondary infection\* . . . Quick Drying . . .

BLU-KOTE contains Acriflavine and Gentian Violet in combination with fungicidal Sodium Propionate and cleansing, debriding Urea. Effective against both bacterial and fungus infections most common in skin lesions of large and small animals.

4 oz. bottle (dispensing label) Per Doz. \$8.00.

**H. W. NAYLOR CO., MORRIS, NEW YORK**



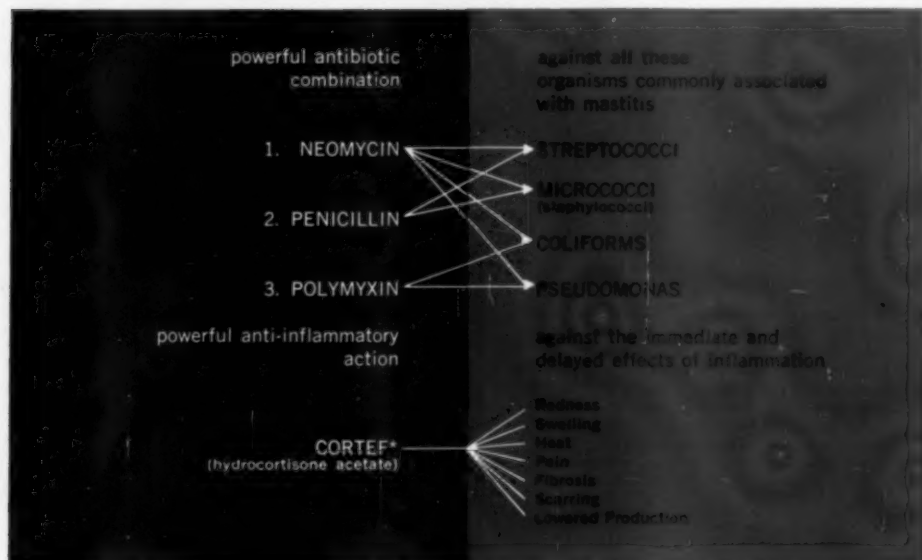
In mastitis, total therapy is indicated

## Teatube\*-CORBIOT\*

a product of **Upjohn Research**

the first formulation for *total therapy*, combining the anti-inflammatory action of *hydrocortisone* with the antibacterial action of *three antibiotics*. Helps protect the milk-producing capacity of the gland while attacking the infection.

Available in tubes of 10 Gm.



Veterinary Medical Department THE UPJOHN COMPANY, KALAMAZOO, MICHIGAN

\*TRADEMARK, REG. U. S. PAT. OFF.



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### Wanted—Veterinarians

Veterinarian wanted as associate in a country practice, 75% large animals, in northern New England. Address "Box A 26," c/o JOURNAL of the AVMA.

Veterinarian wanted to assist in active small animal practice conducted in modern hospital now staffed by 2 veterinarians in suburb of New York City. Address "Box A 28," c/o JOURNAL of the AVMA.

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● Precision manufactured throughout — the Coldlite 'scope gives beautiful distal illumination. Quickly assembled, it can be sterilized by non-PHENOL antiseptic solutions or by boiling. Outside diameter 19/32", inside 15/32". Useable length of scope 5". Complete with obturator, battery handle, spare bulb in polished mahogany case. Write for details.

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Recent graduate wanted as assistant in small animal hospital in New York City; apartment available in hospital. State starting salary desired. Address "Box A 29," c/o JOURNAL of the AVMA.

Associate wanted in small animal practice in Maryland; excellent working conditions and salary; vacation and sick leave guaranteed. Apartment available if desired. Address "Box A 31," c/o JOURNAL of the AVMA.

Veterinarian with field experience wanted for position as diagnostician and consultant. Indiana license or reciprocity necessary. Substantial salary and other benefits. Applicant should submit brief information on background, references, and general qualifications in writing for interview appointment. Address Anchor Serum Co. of Indiana, Inc., P.O. Box 1177, Indianapolis 6, Ind.

Applications are invited for the position of senior lecturer in veterinary medicine (specific and contagious diseases and epidemiology) at the University of Sydney. The salary is within the range £1,800 rising by £70 per annum to £2,150 p.a. (Australian £ = \$2.25) plus cost of living adjustment (£81 men, £61 women), and is subject to deductions

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the Kennel  
Already!"*

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WAYNE for  
Good, Firm  
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Take the  
muss-and-fuss out  
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Feed the complete,  
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**WAYNE DOG FOOD**  
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FOR THE PROBLEMS OF INFERTILITY

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Provides an accurate pattern against which to cut with knife or razor blade. Fits firmly, cannot move or slip when clamped into position. Made of non-rusting, light, cast aluminum, highly polished. Lasts a lifetime with minimum care. Simplicity of design and construction reduces possibility of breakage or mechanical failure. Forms immediately available to provide distinctive marking of these breeds:

Boxer — postpaid \$15.00  
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These patented "championship" forms are patterned after markings of winners of top honors in show competition. Forms for other breeds made on special order. Sold to veterinarians only. Send check or money order.



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under the State Superannuation Act. Commencing salary will be fixed according to the qualifications and experience of the successful applicant. Finance available for home purchase to married male members of staff. Applications, giving names of 3 referees, should be forwarded to reach M. A. Telfer, registrar, from whom further information may be obtained, not later than Jan. 31, 1957.

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Graduate veterinarian, 35, with diverse commercial experience seeks challenging position in poultry industry; interested all phases, especially clinical research, field service, or promotion. Address "Box A 25," c/o JOURNAL of the AVMA.


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Veterinarian with Swiss diploma, several years experience in a veterinary bacteriology laboratory, at present employed in a Swiss university, seeks a suitable post in the United States. Address "Box A 27," c/o JOURNAL of the AVMA.

Hungarian veterinary surgeon (University of Belgrade, Yugoslavia, 1942), 16 years of practice, applies for a job as assistant in the United States. Address "Box A 30," c/o JOURNAL of the AVMA.

### For Sale or Lease—Practices

Dairy practice must be sold immediately; only large animal veterinarian in this progressive community. Annual gross, \$22,500 to \$25,000; a give-away for \$1,500 for practice, drugs and equipment. Address "Box A 7," c/o JOURNAL of the AVMA.



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TODAY

## *new specific treatment for calf scours*

Developed specifically for the control of calf scours, new ENTEFUR provides rapid, effective and safe treatment. ENTEFUR drastically cuts mortality.<sup>1,2</sup> In one study, 60 of 63 ENTEFUR-treated calves survived, whereas in the control group only 3 of 24 calves lived.<sup>2</sup> "ENTEFUR treatment appeared the only factor modifying significantly the course and outcome of the disease."<sup>2</sup>

ENTEFUR contains the new nitrofuran, Furamazone\* (brand of nifuraldezone) for rapid wide-spectrum bactericidal action against gram-positive and gram-

negative enteric bacteria. ENTEFUR also contains bismuth subsalicylate for its mildly astringent, antidiarrheal action.

**ENTEFUR BOLUS VETERINARY**, small, contains: Furamazone 1 Gm., bismuth subsalicylate 0.26 Gm. Dosage: 1 bolus twice a day for 2 days. Supplied: Box of 24 (6 envelopes of 4 boluses each).

REFERENCES: 1. Bull. W. S.: N. Amer. Vet., in press. 2. Henry, R. T., and Blackburn, E. G.: Vet. Med., in press.

# **ENTEFUR**

**NOW AVAILABLE THROUGH YOUR PROFESSIONAL VETERINARY DISTRIBUTOR**



**EATON LABORATORIES NORWICH, NEW YORK**

## Your Symbol of Prestige



Each emblem is deep red, gold, and white

### ● AUTO EMBLEMS

Solid metal and weather-resistant. Attaches to license plate or license-holder. 3½ inches in diameter. Price \$2.50 each.

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Easy-to-apply on office doors or windows. 3½ inches in diameter. Price \$.25 each.

### ● LAPEL PINS

Satin-finish surface featuring AVMA emblem. Popular screw-post design. Price \$.60 each.

Mixed practice for sale in Oregon; home, hospital, completely equipped, x-ray, drugs. Pets 50%, dairy 50%; growing area, grossing \$20,000. Owners will not lease or finance. Address "Box Y 26," c/o JOURNAL of the AVMA.

### Miscellaneous

Pregnancy diagnosis in mares—45th to 150th day. Request mailing tubes; \$7.00, 2 or more, \$6.00 each. Pregnancy Diagnostic Laboratories, Dysart, Iowa.

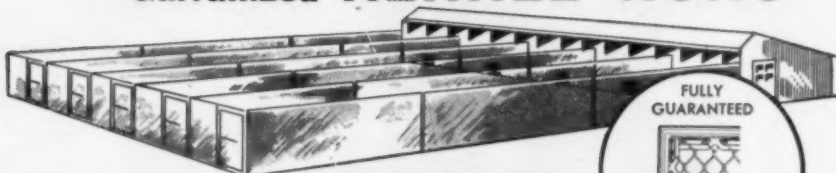
Breedersleve—the disposable obstetrical sleeve. Package of 25 with detachable chest band, \$5.00; lower wholesale prices. Free sample upon request. Breeders Equipment Co., Flourtown, Pa.

Artificial Udder—Beco Litter Feeder—nurses 8 puppies simultaneously. Stays warm; easily cleaned and sterilized. Complete unit, \$15; guaranteed. Breeders Equipment Co., Flourtown, Pa.

The heart rate of diving birds was found to retard by 75 per cent when they submerged; the rate in ducks dropped from about 180 to 45 per minute. When wild pigeons, chickens, or turkeys were submerged, their heart rate dropped only 10 to 25 per cent. This slow rate and their large volume of blood probably explains why aquatic birds can survive up to 15 minutes under water.—*Sci. News Letter*, Sept. 15, 1956.

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### DOUBLE FRAME CONSTRUCTION

Nothing can match Ford Kennels for safety and long service. No tie wires to rust out, no dangerous sharp ends with Ford's exclusive patented double frame construction. Rust-resistant, galvanized chain link fabric is permanently locked to welded inner frame. In a versatile array of panels to meet every need—at easy-to-afford prices.



### 5 COMPARTMENT STALLS

Waterproof. Heavily galvanized sheets. 1½" angle iron frames braced and welded. 1" pipe door frames with dog-proof mesh. Completely assembled. 2' and 3' interior stacking stalls also available. Satisfaction guaranteed.

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in 10 # paper bags

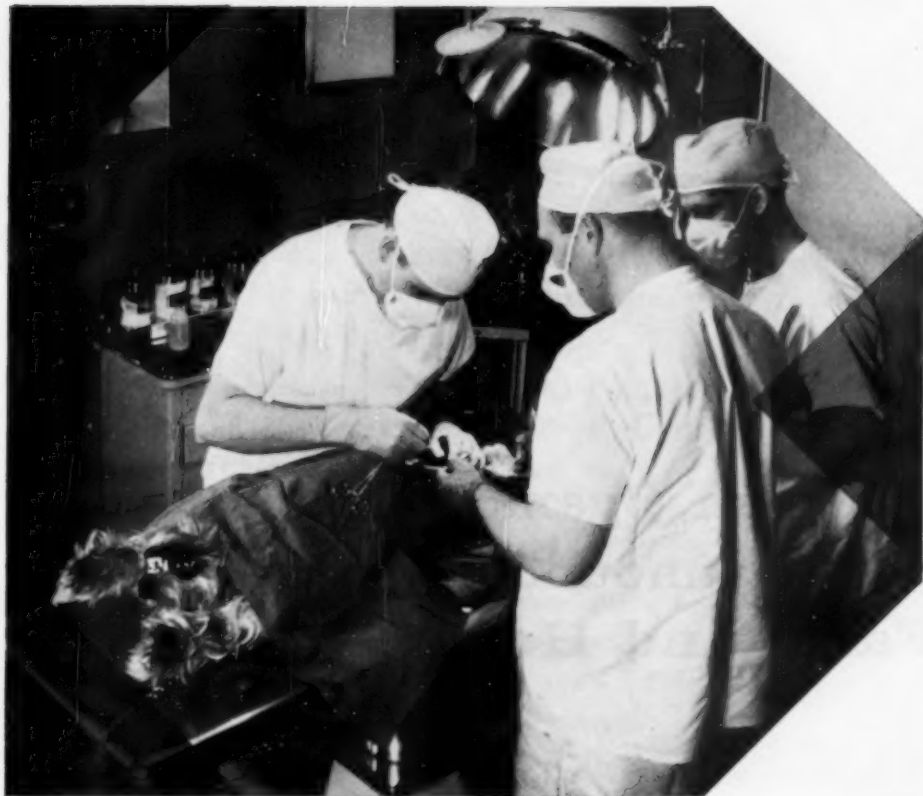
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*First, he figures average dose. He administers about half of it in 20 to 30 seconds. Gives this time to show its full depressant effect. Then, fractional doses—with intermittent pauses—until he reaches*

*... smooth, controlled anesthesia with* **NEMBUTAL®**

When you administer NEMBUTAL, onset of action is prompt, duration and degree of anesthesia are easily controlled. Anesthesia is produced in three to five minutes, lasts 60 to 90 minutes. One-dose administration means no interruptions during operation, no obstructing equipment.

Muscle relaxation accompanying NEMBUTAL anesthesia speeds your opera-

tive procedure. Recovery is safe, with virtually no side effects. And animals remain quiet several hours after operation.

Used safely and successfully in veterinary medicine for more than 23 years, NEMBUTAL Sodium Sterile Solution is available in 100-cc. multiple-dose bottles. **Abbott**

•NEMBUTAL/Pentobarbital Sodium, Abbott

American Cyanamid Company  
announces new  
**Farm and Home Division**



AMERICAN CYANAMID COMPANY, 30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.

American Cyanamid Company announces the formation of a new division, to be known as the Farm and Home Division.

This new division is being created to bring together many of the Company's products which have a common relationship to agriculture and animal health. Our purpose is to make more effective use of Cyanamid's resources for research and product development.

An important unit within this division will be the Professional Service Department, which will offer a broadened product line for the exclusive use of veterinarians.

The Lederle Laboratories Division of American Cyanamid Company will no longer be associated with the marketing of veterinary products. The same sales personnel will continue to serve you, but they will be under the direction of new management, with new policies and practices, and will function under the Cyanamid name.

For a transitory period, some Cyanamid veterinary products will continue to carry the Lederle label. In the near future, all products will carry an American Cyanamid Company designation.

Your orders for veterinary products should be directed to the branch office of American Cyanamid Company presently servicing your account or to your service wholesaler. Until you are notified otherwise, discounts on veterinary products will remain the same.

We anticipate that this new relationship will work to our mutual benefit.

## Correspondence

Journal of the AVMA:

In June of this current year, the Public Health Service informed us that, in their opinion, there was sufficient evidence of rabies in Canada that they had decided all dogs brought into the United States must be accompanied by a certificate (from a veterinarian on either side of the border) to the effect that they had been inoculated for rabies within the past six months. It is the duty of the Customs Service to enforce such a regulation.

Our inspectors along the border ports have found that dog owners are woefully ignorant of such a regulation, resulting in several instances where owners have taken an extremely dim view of being compelled to go back to the nearest veterinarian to have their dog inoculated before bringing it back into the States. We do not know how long this regulation will be in force.

We would sincerely appreciate having you help publicize the fact that all dog owners taking their pets into Canada must have with them a certificate showing the dog was inoculated within the previous six-month period. The advance knowledge of this regulation (see below) prior to trips across the border would prove to be of great assistance to all interested parties.

Canadian Regulations on Dogs Accompanying  
Nonresidents

8. (1) Under regulations of the Canadian De-

partment of Agriculture all dogs brought into Canada from the United States of America shall be accompanied by a certificate in one of the following forms:

a) A certificate signed by a licensed veterinarian of Canada or the United States certifying that the dog has been vaccinated against rabies during the preceding six months; or

b) A certificate signed or endorsed by a veterinary inspector of the United States Bureau of Animal Industry certifying that the dog is free from contagious disease, that it has not been exposed to rabies, and that no case of rabies has occurred within a radius of 50 miles of the place where the dog has been kept for a period of six months preceding presentation for entry into Canada.

2) The certificate must be procured to a Canadian Customs officer each time the dog is brought into Canada.

3) A dog brought into Canada, in transit from one point in the United States to another point therein over Canadian territory, may be allowed entry to Canada without veterinarian documentation conditional upon the owner of the dog furnishing a statement that it will not be allowed to come into contact with another dog in Canada during the journey, which must be continuous.

4) Seeing-eye dogs and dogs trained for public entertainment, if healthy, will be given unrestricted entry.

[Dog owner clients who plan to cross the border should be advised that similar health certificates are required both ways.—ED.]

October 26, 1956

Very truly yours,

s/Wm. N. Kerfoot, Collector of Customs.

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HAIR DRYER DESIGNED FOR VETERINARY USE!



**Introductory  
Offer Only**

**\$ 5 9 5 0**

1 year guarantee  
card enclosed  
with dryer

**THE NEW EVSCO**

**THREE-HEAT HAIR DRYER**

**with Heavy-Duty Construction  
and Big-Machine Capacity!**

**NO FUSES, NO BRUSHES, NO PROBLEMS!** Made of heavy duty cast aluminum. Thermodynamic engineering prevents heat loss. Contains self-cooling motor. Heavy

Nichrome heating element provides for hours of continuous use. One switch control for low heat, high heat or cool air. Neoprene rubber nozzle resists grease, oil and dirt.

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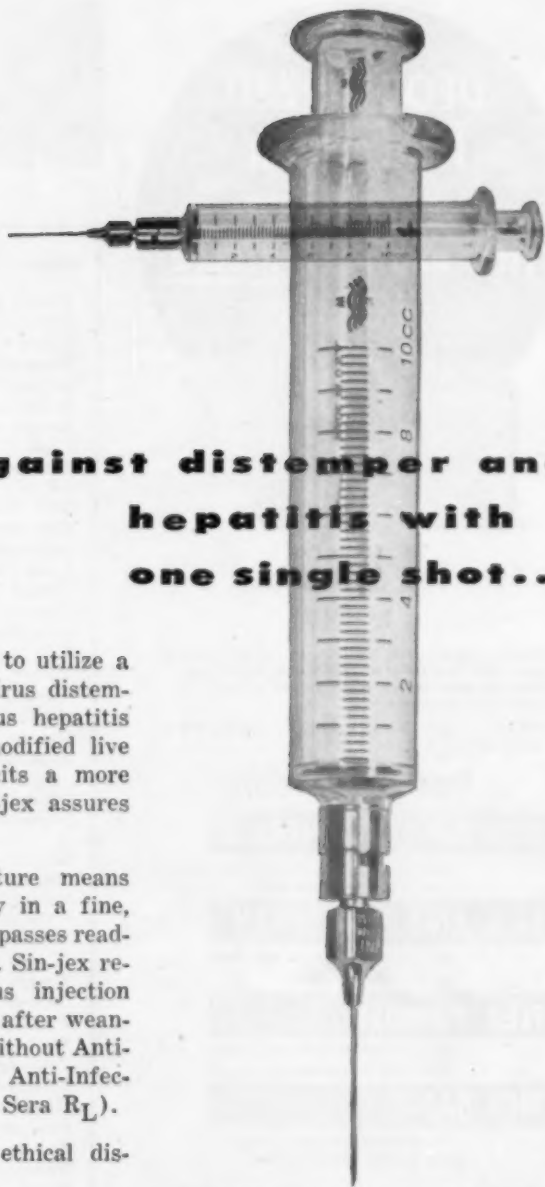
Nozzle opening, 3". Air output at nozzle is 2400 linear ft. per min.; at normal room temperature, hot heat, 162°F.; warm heat, 128°F.; 115 volt, 60 cycle single phase AC operation; finished in gray baked hammer-tone.



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**immunize against distemper and  
hepatitis with  
one single shot...**

Sin-jex is the first vaccine to utilize a vacuum-dried modified live virus distemper fraction, with killed virus hepatitis fraction as diluent! This modified live virus distemper fraction elicits a more marked response; hence, Sin-jex assures more positive immunity.

R<sub>L</sub>'s "reconstitiquick" feature means Sin-jex reconstitutes instantly in a fine, homogenous suspension which passes readily through a 22 gauge needle. Sin-jex requires a simple subcutaneous injection which may be given before or after weaning—simultaneously with or without Anti-Canine Distemper Serum and Anti-Infectious Hepatitis Serum (Bival Sera R<sub>L</sub>).

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distemper hepatitis

**sin-jex**

vaccine



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in every  
**PET CHEMICALS**  
product

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Works . . . with lower toxicity . . . where DDT, Chlordane and Lindane fail.

## Pet Chemicals

### TICK DIP CONCENTRATE

Kills fleas in minutes—all ticks in a few hours. Lasting residual action.

### TICK AND FLEA SPRAY

For kennel or home use. Kills fleas quickly, ticks overnight.

### FLEA POWDER

Kills all fleas in 15 to 30 minutes. Non-toxic even on puppies or cats.

### TICK SALVE

Use between toes and in ears to kill ticks quickly. Residual effect.

Prove Malathion's effectiveness, send to Dept. JV for generous professional samples . . .

## PET CHEMICALS, Inc.

3101 S. W. 38th COURT  
COCONUT GROVE, MIAMI, FLORIDA



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*in  
hemorrhagic  
septicemia  
the way it was*

*the way it is*

"The shipping of cattle during inclement weather causes them to become chilled and their lungs are especially affected by the inhalation of cold air and they are thus predisposed to pneumonia and the omnipresence of *B. bovissepticus* almost insures infection and the possible production of the pectoral form of hemorrhagic septicemia. Medical treatment of this disease is of little value. Various drugs have been used in the different types of this disease, but the fatality still persists at about 90 percent."

Kinsley, A. T.: J.A.V.M.A. New Series 1:49 (Oct.) 1915.

"Treatment with antibiotics or other effective drugs, if given a few days after the animals arrive at the feed lots or at the first sign of the disease, has reduced the number of cases developing in some serious outbreaks.

"When properly timed, they would seem to be more beneficial than bacterins or serums. Furthermore, they avoid the risk of the anaphylactic shock or 'serum reactions,' which occasionally follow the use of bacterins or serums."

Aitken, W. A.: Animal Diseases, U.S.D.A. Yearbook of Agriculture, 1956, p. 255.

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BRAND OF OXYTETRACYCLINE

**INTRAVENOUS** Vials of 250 mg., 500 mg., 1 Gm. and 2.5 Gm. with Water for Solution, U.S.P.

**INTRAMUSCULAR** Vials of 100 mg., 1 Gm. and 5 Gm.  
Prompt, sustained blood and tissue levels for maximum antimicrobial activity.  
Effective against the *Pasteurella* and other organisms frequently associated with outbreaks of shipping fever, whether as primary or secondary invaders.

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Department  
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**POWDER**

**GLYTUSSIN**

A palatable expectorant for large animals and poultry.

**CONTAINS:**

Glyceril guaiacolat.....  
 Ammonium chloride.....  
 In sweetened base.  
 Certified color added

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 influenza, whooping  
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 etc.

Indirectly:  
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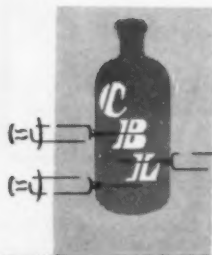
**(Corn Belt)**

... a palatable,  
superior expectorant for  
the relief of respiratory  
congestion in swine,  
cattle and poultry.

One reason for the superior effectiveness of Glytussin Powder (Corn Belt) is that it contains Glyceryl Guaiacolate which is approximately four times more effective than potassium guaiacol sulfonate. It is almost non-irritant with minimal side effects.

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This vaccine builds a strong, lasting immunity to canine distemper with only one injection. Dogs of all ages and all breeds have been successfully immunized with this vaccine.

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Passive immunity against both distemper and hepatitis can be gained by using Lockhart's Chick Embryo Origin Distemper Vaccine simultaneously with a prophylactic dose of **Alosera**—Lockhart's Anti-Canine Distemper-Hepatitis Serum.

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of swine erysipelas...



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